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THE

ASIATIC SOCIETY OF BOMBAY

Town Hall, Bombay.

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TRANSACTIONS

OF THE

BOMBAY GEOGRAPHICAL SOCIETY,

FROM MAY 1849 TO AUGUST 1850.

EDITED BY THE SECRETARY.

VOLUME IX.

BOMBAY.
PRINTED AT THE "TIMES" PRESS,
BY JAMES CHESSON.

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PREFACE.

THE present number of our *Transactions* having been considerably longer at press than was contemplated, and having swollen out to an unusual size, the publication of the meteorological papers, which now forms a separate division of our Reports, and was meant to have been added as an Appendix to the present issue, has for the present been postponed, the papers themselves not being as yet so complete as might be desired.

I have for the present been compelled to defer a general abstract of the papers on Hailstorms and Meteors with which they were intended to have been prefaced. As the two are meant to form the first of a series of papers on these subjects, the intended resumé may probably come in more opportunely afterwards. I find in the catalogue of Professor B. POWELL for 1849, a number of descriptions of meteors sent to him from India direct, and not published here: of these I may probably hereafter find it convenient to avail myself.

The deplorable backwardness of the pictorial arts amongst us has prevented me getting the plate intended for the illustration of Mr WATERSTON'S observations on the graphic method of keeping meteorological registers ready for the present number: it will, it is hoped, appear in the next.

Since the paper on the probable existence of Sub-Marine Currents was prepared, the Instrument for the determination of their force, velocity, and direction, has been made trial of by Commander CAMPBELL, of the *Queen* Steamer. The force plate is so affected in its action by the movements to which the ship, even in the calmest weather, is subjected, as to prove unserviceable for the purpose intended, and another contrivance must be substituted in its place : this portion is by much the least important part of the instrument, I had some doubts of its efficiency from the first, but considered it deserving of a trial. The direction-vane works with much ease and precision, and a common pocket compass, placed outside the needle box, shows the direction at once, without the screws requiring to be undone. Such, however, is the difficulty of excluding the water at great depths, that I deem it better to make an aperture at once to admit it freely, or rather to fill the globe with water beforehand when the instrument is proposed to be used than to attempt its exclusion : the magnetic bar inside may be protected from its action by electrotype gilding—by a copper coating by the simple method just discovered, or by a coating of varnish. As the bar must be a pretty heavy one to traverse freely in water, I propose having it fitted up on the plan recommended by Mr DENT for steering compasses, with a spindle through and through, turning at both ends in sockets—compelled to sweep in a plane at right angles to its axis, instead of resting with a cap on a pivot in the ordinary way.

These alterations, with the change requisite in consequence in the clamping gear, will, I am satisfied, make the instrument perfectly serviceable for the very interesting and important investigations in which it has been and is proposed to be employed.

I may, I trust, be pardoned for here expressing my gratitude for the promptitude with which my request to have it constructed at the Steam Factory free of charge was complied with by Government, and the extreme attention bestowed on all my directions by all the parties connected with the Dockyard.

Commodore LUSHINGTON will probably accept of my public acknowledgments on these heads, as well as for the consideration shown me in placing the experiment in hands so eminently able and competent as those of Commander CAMPBELL, of the *Queen*.

Ed. of the Trans.

BOMBAY, 7*th September*, 1850.

MEETINGS

OF THE

BOMBAY GEOGRAPHICAL SOCIETY.

THE Ordinary Monthly Meeting of the Bombay Geographical Society took place on Thursday the 21st June, at 3 P. M., in their Rooms, Town Hall. In absence of the President and Vice-Presidents, Dr. J. BURNES, M. D., K. H., Senior Member, took the Chair—afterwards Captain HAWKINS, I. N., Vice-President. The following gentlemen were present :—Major J. HOLLAND; Capt. H. J. BARR; Col. GEORGE MOORE; Capt. S. V. W. HART; Capt. R. ETHERSEY, I. N.; JOHN SMITH, Esq.; The Ven'ble Archdeacon G. PIGOTT; Commander G. JENKINS, I. N.; H. GIRAUD, Esq., M. D.; Captain J. P. SAUNDERS, I. N.; Doctor JOHN PATCH; S. S. DICKINSON, Esq; H. CONYBEARE, Esq.; and Dr. GEORGE BUIST, Secretary.—The minutes of last meeting having been read, and approved of, the first business in the notice paper was the election of Captain Ross to be Honorary President. The Chairman having been requested to open the subject, spoke nearly to following effect :—

"Having been placed so unexpectedly in the chair, it falls to me to introduce the propositions noted in the Circular; and I have in the first instance to announce the secession from our Chair, on the grounds of continued ill-health, of our deservedly respected President, Captain DANIEL ROSS. This announcement will, unhappily, take few by surprise, for we have most of us seen with deep regret his failing health, caused by a long, arduous, and honorable career in a tropical climate. Long before our Society was instituted, Captain Ross had established for himself a European reputation of a high order, as one of the most practical and correct of Eastern Hydrographers; and the fortunes of many merchants, and the lives of many mariners, have been saved by the results of his patient and scientific labors. Greater distinction than this, I presume, no one can achieve! In selecting such a man to be our President, we did ourselves honor; and there are many at this table who can bear me out in the assertion, that no where could we have found one to take more interest in our proceedings, or who could have fulfilled the duties of his office with greater ability, attention, or urbanity. In accepting the resignation of this good and able man, I believe that you will gladly concur in the proposition I have now to make,—that, as a fitting mode of evincing our respect for his services and worth, we should appoint him Honorary President of our Society for life. Let us hope that in his retirement, besides being cheered by the recollection of his own good deeds, his latter days may be passed in comfort under the fostering care of the Government he has so nobly served *for more than half a century;* and that, for the credit of our age and nation, he who, in the vigor of manhood, has benefited his fellow men so largely, may not in his old age

have to feel the bitterness of neglect and the hard pressure of poverty, and add one name more to the list of Martyrs of Science!

"We have now to consider of the fittest person to succeed Captain Ross, and it is gratifying to think that if we are obliged to part with one valued old friend, we have still another to put in his place. Need I say I mean the gentleman who has been filling the Chair so much to our satisfaction since Captain Ross's increasing infirmities have forced him to withdraw from us, and whom I allude to—not in the strictly official character given to him in this circular, as Senior Vice-President, but rather—in his personal capacity, well knowing that it is in that character the Society wish him for their President. If he has not been an unwearied Navigator and Surveyor of the Eastern Seas, like Captain Ross, he has been for years a constant attendant at the Meetings of our Society, promoting its objects by every means within his reach—private and official,—maintaining a gratifying and profitable intercourse between it and the Government, and affording to all its Members who may have appealed to him, aid and information in the most kind and courteous manner. A man capable of intense exertion himself, he has been ever ready to appreciate and encourage the services of others in geographical research as well as in all other public pursuits; and I am certain that I express the universal feeling of the Society when I propose that Mr WILLOUGHBY be requested to take upon himself the duties of its permanent President. He will then be at the head of the two most useful and distinguished Societies connected with our settlement: and I certainly know no one amongst us who has a better claim to fill so eminent a position."

These propositions having been seconded by Major HOLLAND, were unanimously adopted by the Meeting; and thereafter, Dr. BURNES having resigned the Chair in favour of Captain HAWKINS, I. N., Vice-President, who had come in in the mean time, the latter gentleman proposed Commodore LUSHINGTON to be a Vice-President of the Society in lieu of Mr WILLOUGHBY, which proposition being seconded by Captain ETHERSEY, was also unanimously agreed to.

Captain JENKINS proposed that the designation of Patron and Honorary President be that conferred on Captain Ross, and that he be requested to sit for his portrait—the picture to be hung up in the rooms of the Society. It was stated that this was a new motion, of which notice required to be given beforehand; and Captain JENKINS accordingly intimated his purpose of bringing the matter forward next meeting.

The following report from the Committee on Physical Research, was read, and, with the exception of Clause IX., unanimously approved of:—

"*To the President of the Geographical Society.*

"SIR,—The Committee on Physical Research, appointed by the Society under date 22nd Dec. 1848, having had various matters referred to them by the Secretary, appointed to prepare reports on the Researches of the Society in Physical Geography, have adopted the following resolutions, which they beg to hand up to the Society, as embodying their first Report.

" I.—That it is expedient that the Committee on Physical Research report the results of their labours so far as they have hitherto gone, in hopes of obtaining the approval of the Society for the prosecution of the Researches in Physical Geography in which the Society is now engaged.

" II.—The Committee consider the accompanying specimen of the form in which the Aden observations are proposed to be printed, and which bears a close resemblance to that recommended by the Royal Society, most suitable; and recommend that this, in the case of the Aden and all other observations, be adhered to as closely as possible.

" III.—The Committee are of opinion that the reprints of the Observations should appear as an Appendix to the Transactions of the Society, as approved of by the General Committee in November 1847, and that 100 spare copies should be thrown off and set aside, to be afterwards bound up in a book along with the Reports on the Observations, which can only be drawn up when these are completed.

" IV.—The Committee are of opinion that the large Wind and Rain-Gauge by Newman after Ostler, should be forwarded to Sawunt Warree, where an intelligent native, trained at the Colaba Observatory, in the service of Major LeGrand Jacob, an indefatigable labourer in the cause of research, is likely to secure for the Society such service as is desired, and to forward them such returns as are wanted.

" V.—That a Tide-Gauge and other instruments be forwarded to Porebunder, to be placed under the charge of Captain Ashburner. Though Porebunder be not perhaps so eligible a point as might have been desired for Tidal Observations, as regards the configuration of the Coast line, or Coast peculiarities, yet, considering the difficulties of obtaining qualified observers, the valuable services of Captain Ashburner ought at once to be taken advantage of, and as much made of the station as possible.

" VI.—The Committee have for some time past watched with much interest and care, the exertions of Mr. Mayes at Aden; and, considering the difficulties he has had to contend with, and the large amount of valuable work he has performed, strongly recommend him to the consideration of the Society as deserving of their most grateful acknowledgments.

" VII.—The Committee regret that any delays should have occurred, or misunderstandings come into existence, calculated to interfere with the progress of researches, and the elimination of facts, in which the world at present profess the deepest interest.

" VIII.—That the large Tide-Gauge by Hunt shall be retained at the presidency: it is intended for a regular stone building, and the expence of transporting it, constructing a place for its reception, and setting it up, threaten to exceed that of a lesser gauge, the price of the instrument included, such as the Society can secure.

" IX.—The Committee recommend that for the present, half the order for instruments sanctioned by the General Committee, be forwarded to Mr Adie, in terms

of the letter of the Secretary, copy of which is annexed—the residue to be ordered when required: it is believed that the bulk of these will have been subscribed for by the time of their arrival.

"X.—The Committee have to express their regret that the instruments received from Government were too late of reaching them to permit any of them to be forwarded to their destination, with the exception of those meant for Phoonda Ghaut. Kurrachee had been in part provided by indent on the grand arsenal before the Government sanction for a loan was obtained.

"XI.—The Committee strongly recommend that the original or copies of the whole of the letters, circulars, minutes, and other papers, from 1844 to the present time, connected with the scheme of Physical Research, be collected together in one volume, and carefully indexed for the sake of reference,—it being often a most difficult, tedious, and perplexing task, to discover what has already been done; and desire that the Secretary shall from time to time make up reports such as that which accompanies this, as to the number and state of the instruments, the condition and performances of the observatories under the Society's charge, and the amount and value of the papers in their archives, and state of their readiness for publication." "(Signed.) J. HOLLAND, R. ETHERSEY, H. GIRAUD, J. PATTON, J. WATERSTON, J. N., G. BUIST."

The following is a copy of the circular sent round to the General Committee, and assented to with one exception unanimously:—

To the General Committee of the Geographical Society.

GENTLEMEN,—I am directed by the Committee on Physical Research to submit the following proposition for your consideration.

That as the Society was for many years in the habit of providing itself with instruments, to be GIVEN or *lent* to those requiring them, a supply be purchased for sale—there being at no time really good instruments to be had in Bombay at any price, and rarely instruments at all, save on the most extravagant terms, and of the worst description.

The Committee proposes that the following be procured: they may, it is believed, be provided at the prices annexed; and after the whole cost with breakages and incidents has been divided amongst them, may be sold at the prices subjoined:—

	Cost Price.	Sale Price of each.
Ten Mountain Barometers, £6 each,	£ 60 0	Rs. 75
Ten Marine Barometers, best quality, £6 each,	£ 60 0	„ 75
Ten Sympiesometers, £5 each,	£ 50 0	„ 60
Ten Pairs of self-Registering Thermometers, £1: 5s.	£ 12 10	„ 15
Twenty Common Single Thermometers, 10 shillings each,	£ 10 0	„ 6
	£ 192 10	

Or say Rs. 2100. It is believed that the half of these will be ordered by parties before the goods arrive, and that the whole will be sold within six months of their arrival.

The Marine Barometers now mostly in use are worthless for service in the tropical seas, and those proposed to be ordered will be constructed something at all events in accordance with the present state of Science. The proposition was brought forward by Mr. Waterston, seconded by Captain Ethersey, and approved of by Major Holland and Mr. Patton, and the whole of the members of the Committee present.

If thought proper, a few Aneroid Barometers, which may be had for about £4 each, and sold for Rs. 50, might be added to the above.

I remain, gentlemen, your obedient servant,

Bombay, 25th May, 1849. (Signed) GEORGE BUIST.

Mr. PIGOTT said that he begged to record his objection to the proposed purchase of instruments, as subversive of the interests of the Society, injurious to its funds, and not consonant with the principles on which it was founded. He had had

occasion, along with others, some twelve months ago, to make a report on the state of the funds of the Society, and found that its income and expenditure in general very nearly balanced each other, and it was now proposed to expend, as he understood, Rs. 3,000 on the purchase of instruments—an amount closely approaching to the entire sum that was at present at the credit of the Society.—so as to threaten to run them into debt. He protested against any expenditure of the Society's funds being made by the Committee.

The SECRETARY stated that Mr. PIGOTT was on several points under a misapprehension on the subject. In the first place, the Committee did not claim any right to meddle with the funds unless by the permission of the Society: that though the present matter had originated with the Committee on Physical Research, it had been referred to the General Committee, who, with one exception, were unanimous in its favour. It had been deemed expedient, in the first place, to ask for large powers from the General Committee, and the amount of expenditure agreed to by them amounted to Rs. 2100, not Rs. 3000 as Mr PIGOTT supposed. That the sub-committee, on re-considering the subject, agreed to reduce the first order by one half, and the present sum amounted to about Rs. 800 to Rs. 1200. Gentlemen desirous of being provided with instruments through the Society, required to make a deposit equal to half the estimated amount of the order; and there were already various orders sent in, so that to this extent the primary outlay was diminished, and it was believed that by the time the instruments arrived, the greater part of them would be ordered. It was not, as Mr PIGOTT supposed, intended that any part of the risk should fall on the Society's shoulders, save that of making so bad a selection as that instruments should remain unsold in their possession, or of breaking them through gross negligence while in their stores. On the arrival of the instruments, the whole costs—packing, freight, duty, and breakage on the way—would be divided amongst them, and they sold at the price this permitted, without any commission. A remittance was proposed to be made along with the order, so that the highest discounts permissible on a wholesale transaction with advance payment would be made: of all this the purchaser would have the benefit. So far from the present plan being at variance with the principles, or the earlier practice, of the Society, it was but a few months since a return had been made of the instruments originally possessed by them, and in part still in their possession. From this it appeared that the Society had been in the habit of purchasing instruments for the purpose of lending them to travellers, but that those to whom they were lent seem not to have been very particular in their return: as an instance, four barometers had at one time belonged to them, of which one only was now in their possession. They had pocket-compasses, dipping needles, atheroscopes, thermometers, &c. &c.—Mr PIGOTT stated that most of these had been presented to the Society.—The SECRETARY said that some of them might be so, but he found an early entry in their minutes of Rs. 400 remitted for the purchase of instruments, and he was under the impression that various others may be discovered. The sole change now contemplated was this—that in place of purchasing instruments for the purpose of lending them, in the knowledge that if once lent they would very likely never see them back again—a plan which had been found to tax the revenues of the Society far too severely to be persist-

ed in,—it was now proposed to purchase instruments with the view of enabling travellers and observers to supply themselves on the spot with these of the lowest price and best quality,—and that this seemed strictly consonant with the original rules and objects of the Society, and eminently calculated to advance geographical research. The Society at the same time was in no way bound by the resolution of the Committee on the subject. This was brought forward now expressly with the view of being considered by the Society,—no step whatever having as yet been taken by which any one was compromised.

Mr PIGOTT said he was aware that on the present occasion he stood in the minority—he merely desired to enter his dissent. The vote was then taken on the report of the Committee exclusive of the clause on instruments—on this the Society were unanimous. On the clause on instruments they were also unanimous with the exception of Mr PIGOTT, who entered his dissent.

The following papers were then laid on the table :—

PAPER.—By Government. A report on "Torun Mal," in the Satpoora Mountains, in the Sultanpoor talooka of the collectorate of Khandeish, dated camp at Shada, the 28th April, 1849. By Lieutenant C. P Rigby, Western Bheel Agent. With a letter from A. Malet, Esq., Chief Secretary to Government, Political Department, No. 2574, dated 14th June instant.

BOOK.—By Government. The Journal of the Indian Archipelago and Eastern Asia for March 1849, Volume 3rd, No 3. With a letter from J. G. Lumsden, Esq, Secretary to Government, General Department, No. 1763, dated 26th May 1849.

LETTERS.—From W. K. Worster, Esq., dated 18th May 1849, forwarding Observations taken at the Madras Magnetic Observatory for the months of April and May 1849.

From Mr. Caldecott, dated Trevandrum, 29th May, 1849, forwarding a packet containing a copy of the Monthly Meteorological Abstracts from January 1848 to April 1849.

From Capt Stewart withan Abstract of Meteorological Observations from the ship Rajasthan.

From H. Piddington, Esq., dated Calcutta the 24th May 1849, acknowledging the receipt of the Society's letter and circular, and referring to those of lower Bengal. An entire set of the Calcutta records from 1836 to 1849 have been forwarded by the Deputy-Surveyor-General, at Mr. Piddington's desire.

From Commander C. W. Montriou, I N., in charge of the Observatory, dated Bombay Observatory, the 11th instant, begging to withdraw his name from the General Committee of the Geographical Society, and also from that of Physical Research, and requesting to communicate the same to the Society

From Captain C. D. Mylne, Acting Secretary to the Military Board, No. 4137 of 1849, dated 5th June instant, forwarded an extract para 2nd from Government, No. 568, dated the 19th ultimo, stating that a price should be fixed upon the Instruments to be supplied to the Society, and appending a statement of the value of the several instruments which the Board are authorized to issue out on loan to the Society.

From Surgeon B White, 3rd Cavalry, dated Sholapore, the 29th May 1849, requesting to be favoured with a list of such instruments as are on hand, with prices, to be supplied to applicants. Also requesting to be proposed as a Member of the Society.

To make the subjoined letter from Government more clearly understood, the letter of the Society to which it is a reply is prefixed :—

No. 18 of 1849.

To Lieutenant-Colonel MELVILL, Secretary to Government, Marine Department, Bombay.

SIR,—I am directed by the Geographical Society to forward you copies of letters addressed to the Officer in Charge of the Observatory, under dates the 22nd December, 1848, and 22nd January 1849, requesting permission to obtain extracts from the Records of the Observatory; together with Captain Montriou's reply, dated 30th January 1849, declining the permission asked for. The extracts written for, are noted in the margin. From the letter of Government under the Marine Department, under date the 19th November 1847, No. 1660. and 27th January 1848, No 171, the Society had hoped that Captain Montriou would have at once endeavoured to comply with their wishes, as all the Society desired might, they believe, have readily been prepared betwixt the 22nd December and the time when the Records were passed into the printer's hands; nor will the slightest obstruction to the passing of the papers through the press be occasioned by proofs of those already in type being furnished, and permission given to make extracts from those about to be put in print.

The monthly and daily means for pressure, temperature, and humidity. The general phenomena of the wind and rain. The pressure and temperature observations, so long as the instruments were disturbed, for the following periods of perturbation during 1848 :—Feb. 7, and 8; March, 19 and 22; April, 6, 9, and 25; May, 1, 8, 13, and 15, and 19, 26, and 27; July, 20, or the date corresponding with the Calcutta Hurricane; October, 4, 9, 10, and 21; 6, 17, and 28, October, and 24, with any irregular readings that may be discoverable.

I am directed by the Society to observe, that on no occasion known to them have such Records as those referred to been passed through the press, even in London, within less than a twelvemonth of their being placed in the printer's hands; and that there is not the slightest probability of the Colaba Records being ready for issue earlier than 1850: that reference to them was always considered indispensable for the furtherance of the scheme of concerted observation, of which from the beginning Government have been pleased to express themselves so favorably.

In reference to the concluding paragraph of Captain Montriou's letter, I am desired to observe, that it would take many weeks to copy the tracings. The inspection of these was solicited merely to see what curves the tides and winds described: they must have ceased to be of the slightest use to the Observatory the moment the Abstracts for printing were taken from them.

In your letter of the 19th November, No. 1660 of 1847, it is stated that the publication of the Tidal observations then in progress at Bombay, as well as those being made at Aden, and those which might hereafter be instituted, would be made over to the Society; and it was proposed that the assistance of the Observatory in the reduction of them into the form already determined on for Aden, should be solicited, that the whole might be placed in the printer's hands with as little delay as possible

"The Hon'ble the Governor-in-Council is pleased to entrust the Society with the superintendence and printing of the Tidal Observations now in progress at Bombay and Aden, as well as those which may hereafter be established."—*Letter of Colonel Melvill, 21th Jan.*, 1848.

The Aden Meteorological observations for 1848, now in process of reduction, afford the data of the climate for a single year only; and the observations of another year are requisite before it can be seen whether those of 1848 conform to, or depart from, the usual type. An inspection of those already made, promised the Society in your letter of the 1st April 1846, would be conclusive on the point.

"If agents can be procured, Government will endeavour to make their services available; and to construct or appropriate for their use such buildings as may be wanted when the scheme is fairly established under the guidance of the Society. The Government will make over to them the services of Mr Mayes, together with a Record of all the observations he may have previously made."—*Letter of Colonel Melvill, 1st April*, 1846.

I am, on these grounds, directed by the Society, respectfully to solicit permission from the Right Hon'ble the Governor-in-Council to make extracts from the whole of the Manuscript Records of the Observatory at Colaba and Aden, which it may be desirable to consult, now in the custody of Captain Montriou, or in the hands of the printer,—or printed sheets of these where such are already thrown off

The Society pledge themselves that no injury shall be occasioned the Records, or interruption to the progress of the work; and the obligations incurred by them for extracts or information of any sort, shall be most fully and faithfully acknowledged by them

I have &c (Sd) GEORGE BUIST. Secretary to the Society.

Geographical Society's Rooms, Town Hall, Bombay, 2nd April, 1849.

No. 634 of 1849.—Marine Department, Bombay Castle, 31st May, 1849.

SIR,—I am directed by the Right Hon'ble the Governor in Council to acknowledge the receipt of your letter, dated the 2nd of April last. and to acquaint you, for the information of the Geographical Society, that the Right Hon'ble the Governor in Council understands from the officer in charge of the Observatory that the Tidal observations under his charge for the years 1846. 1847, and 1848, have already been laid upon your table, and that the other documents to which you refer cannot now be made available in the manner, and for the purpose, required, without materially retarding the great object of speedy publication. His Lordship in Council therefore regrets that he cannot comply with the request of the Society in the full terms in which it is expressed in your letter, but feels assured that Commander Montriou, who is himself a member, and not an undistinguished member, of the Society will not fail to afford to it, in the prosecution of its researches every assistance which it is in his power to grant consistently with his paramount duty to the Government and the Hon'ble the Court of Directors.

I have the honor to be, Sir your most obedient servant,

J. G. LUMSDEN, Secretary to Government.

The following are the enclosures referred to in para 1st of the above letter. The subject will be found discussed in the report of the meeting for February—see Vol. VIII.

No. 58 of 1848.

To Captain C. W. MONTRIOU, I. N., in charge of the Observatory at Colaba.

SIR,—In conformity with the intimation conveyed in the letter of Colonel Melvill, dated 27th January 1848, placing you in direct communication with the Geographical Society on the subject of Tidal and Meteorological observations, I am directed by the Society to request that you will be good enough to permit copies of the monthly abstracts of the Barometer, the Thermometer in the shade, and the wet-bulb Thermometers, to be made either by a party suggested by you, or deputed by the Geographical Society, or by any means such as may seem most expedient to you.

The object of this request is to enable me to draw up an abstract for the year 1848, in conformity with the resolution recorded at the commencement of the present scheme in 1845, by which the Observatory at Colaba was proposed to be the point of reference for all other observations, both of the Tides and Climate.

The tracings of the Tide and Wind Gauges, will be most acceptable as taken by the instruments. I have &c., (Sd) GEORGE BUIST, Secretary to the Society.

Geographical Society's Rooms, Town Hall, Bombay, 22nd December, 1848.

No. 5 of 1849.

To Captain MONTRIOU, in charge of the Observatory Colaba.

SIR,—I am directed by the Geographical Society to call your attention to the circumstance of the letter under date the 22nd ultimo, soliciting extracts from the Records of the Observatory, still remaining unreplied to.

The Society is particularly anxious that as little delay as possible should occur in preparing the reports on the Meteorology and Hydrography of Western India, Scinde, and Aden, for the Press, and for the first of these, access to the records of the Colaba Observatory, considered from the first to be the reference point for all these observations, is matter of much importance.

I have &c. (Signed) GEORGE BUIST, Secy. to the Society.

Geographical Society's Rooms, Town Hall, Bombay, 22nd Jan., 1849.

No. 7 of 1849.

From Commander C. W. MONTRIOU, I N., in charge of the Observatory,
To the Secretary to the Geographical Society.

SIR,—In answer to your letters bearing date December 22nd 1848, and January 22nd 1849, I beg to inform you that the Observations therein alluded to are now passing the press, consequently are not available for the purpose required; when printed, the Geographical Society will doubtless be furnished with a copy.

Any person deputed by the Geographical Society will be allowed to copy the tracings of the Tide-Gauge. I have the honor to be, your most obedient servant,

C. W. MONTRIOU, Commander I. N., in charge of Observatory.

Observatory, Colaba, January 30th, 1849.

No. 51 of 1849.

To Commander C. W. MONTRIOU, I. N., in charge of Observatory at Colaba.

SIR,—I am directed by the Committee on Physical Research respectfully to call your attention to the following paragraph from the letter of Government, under the Marine Department, No. 634, dated 31st ultimo, together with the extract subjoined to it from the Secretary's circular sent round with it:—"His Lordship in Council therefore regrets that he cannot comply with the request of the Society in the full terms in which it is expressed in your letter, but feels assured, that Commander Montriou, who is himself a member, and not an undistinguished member, of the Society, will not fail to afford to it, in the prosecution of its researches, every assistance which it is in his power to grant, consistently with his paramount duty to the Government and the Hon'ble the Court of Directors."—"The following is a list of the more remarkable perturbations for 1849, so far as the year has yet elapsed It would be eminently desirable to obtain hourly readings of the Barometer for two or three days on the occurrence of these, or for as long a period as any disturbance was manifest.

"January	8, 13, 14, 15, 22, 23.
February	1, & 4, 20 & 23.
March	5, & 6, 20 & 22.
April	5, 7, 14, 19 & 23.
May	1 & 3, 12, 13, 14.

"By far the most convenient arrangement would be for us to obtain a monthly abstract of Barometric returns, such as is published in the Observatory reports, commencing the day at 3 A. M, Bombay time: one of these supplied each month would meet all our wants."

It would be a very great obligation to the Society could the information referred to be obtained from the Observatory monthly, and the most expedient arrangement for all parties would probably be to permit an entire copy of your Pressure tables, commencing the day at 3 A. M., to be taken as soon after the close of the month as is convenient for you.

A writer will be sent at any time most suitable to you for taking copies, or, if any of the assistants of the Observatory have leisure, and are allowed to perform the work, they will be remunerated.

I need not add, that the Society will take due care that the amount of its obligations to those supplying information or affording assistance, will be faithfully acknowledged.

I have &c. (Signed) GEORGE BUIST, Secretary to the Society.

Geographical Society's Rooms, Town Hall, Bombay, 8th June, 1849.

No. 30 of 1849.

From Commander C. W. MONTRIOU, I. N., in charge of Observatory,
To the Secretary to the Geographical Society.

SIR,—I have the honor to acknowledge the receipt, on the 10th instant, Sunday, of your letter No. 51 of 1849, dated June 8th, 1849, and have, in reply, to state, that the observations detailed in para. 1 shall be furnished as early as practicable.

A general monthly abstract of the Meteorological observations made at the Observatory will be prepared and duly forwarded to the Geographical Society; the time in use at the Observatory is Gottingen time, which the Committee of Physical Research will find no difficulty in reducing to Bombay Time. I have the honor to be, Sir, your most obedient servant,

CHAS. W. MONTRIOU, Commander I. N., in charge of Observatory.

Observatory, June 11th, 1849.

Subjoined is Mr LUMSDEN's letter—prefixed is that to which it replies. The Society from the first had proposed to trace the tidal wave from point to point, and considered it convenient that all the tidal observations made at the various points should appear together. There is no register of tides in any one of the reports of the sixty observatories similar to those of Colaba up and down the world—nor in the Colaba reports from 1841 to 1846.

No. 39 of 1849.

To Lieut.-Colonel MELVILL, Secretary to Government, Marine Department, Bombay.

SIR,—The Geographical Society have just received printed copies of the Tidal Observations made at Colaba, for 1846, 1847, and 1848, sent by permission of Government, for which I am directed to offer their most grateful acknowledgments. From the tenor of your letters dated 1st April 1846, 19th December, and 27th January 1848, the Society had come to the conclusion, that it was intended that the Tidal Observations made at Aden, Kurrachee, and other places, were up to the end of 1847 to have been published along with the Bombay observations; and that from the 1st of January 1848 the publication of the Tidal observations made at Bombay, Aden, and Kurrachee, and all other places, were to be entrusted to the Society.

"Forms of records and instruments have been supplied to Serjeant Mayes by Professor Orlebar at present in charge of the Observatory, and it is intended that the results of the Serjeant's observations shall be published together with the Magnetic and Meteorological Observations of the Observatory."—*Letter of Colonel Melvill, 1st April*, 1846.

"The Hon'ble the Governor-in-Council is pleased to entrust, as an experiment, to the Geographical Society, the superintendence and printing of the Tidal Observations now in progress at Bombay and Aden, as well as those which may hereafter be instituted"—*Letter of Colonel Melvill, 19th December*, 1846.

"It is not, I am directed to observe, the intention of the Governor-in-Council to interfere with the publication of the Observations which have already been taken at Bombay and Aden. Instructions have been issued for the printing of these in order that they may be transmitted to the Hon'ble the Governor-in-Council for communication to the Royal Society, and copies will also be furnished to the Geographical Society. The resolution of Government to confide to the Geographical Society the printing of the Tidal Observations, applies to the future and not to the past; and the Governor-in-Council proposes, as a convenient and suitable period for the purpose, that the 1st of January 1848 be the date from which the Society's operations, under sanction of Government, and their assistance, are to be considered to commence."—*Letter of Colonel Melvill, 27th January*, 1848.

The Aden observations for 1846 and 1847 do not appear to be included in the Bombay reports, so that the Society are apprehensive of some misunderstanding on this point,—as it is obvious they have altogether misapprehended the purposes of Government in reference to the Bombay Observations which have been published down to the commencement of the present year,—as no object whatever can be secured by the re-publication of matter already in print.

I am on these grounds, directed respectfully to request that Government will inform them whether it be hereafter intended to include the Bombay Tidal Observations in the Magnetic and Meteorological reports, or to commit them to the charge of the Society; and whether the Aden reports for 1846 and 1847 are to be published along with the Colaba records?

This information is desired, to enable the Society to make its arrangements for the publication of the observations entrusted to their charge. The vehicle in which scientific information appears, is of secondary importance in comparison to the promptitude of its appearance, so as to enable facts collected at points distant from each other to be compared with the view of obtaining general results.

I have &c. (Sd.) GEORGE BUIST, Secretary to the Society.

Geographical Society's Rooms, Town Hall, Bombay, 16th May, 1849.

Marine Department, No. 689.—Bombay Castle, 16th June, 1849.

SIR,—I am directed to acknowledge the receipt of your letter, No. 39, dated 16th ultimo, and in reply to inform you that it is intended that the Bombay Tidal Observations shall not be omitted in the annual reports of the Colaba Observatory, as without these observations the reports would be incomplete, but this does not necessarily affect the operations of the Geographical Society.

2.—On the subject of the Aden Observations, a future communication will be made to you.*

I have the honor to be, Sir, your most obedient servant,

To the Secretary to the Geographical Society. J. G. LUMSDEN, Secy. to Govt.

Attention was specially directed to the exertions of Mr LEACH at Kurrachee. Mr. LEACH had been provided with instruments late in April: at first there was some objection to his using them, when the commanding officer had stated

* See post—Letter of Captain Montriou, July 25, report of meeting for August.

on the matter being fully explained, that he saw no reason why a soldier should not amuse himself with barometers or thermometers as well as with long-bowls or racket, if it did not interfere with the discharge of his duty. Mr LEACH (who had been an assistant to Mr MAYES in his meteorological labours at Aden) had instructed some of his comrades, so that the work might go on without interruption. He had commenced on the 1st of May, and he had on the 5th of June forwarded the following papers:—observations for every hour, taken for twenty-four hours on end, for the 1st, 8th, 15th, and 22nd; for every day of the month hourly from sunrise to sunset, and the barometer's turning-points (barostices) at ½ past 3 and ½ past 9 A. M., and 4 and 10 P. M. These barometrical readings had been entered as taken, then corrected for temperature &c., and filled in in schedules provided by the Society, so as to be at once fit for the printer's hands; while neatly drawn-up diagrams accompanied them, which furnished a key in a moment to the tables. Mr MAYES and Mr LEACH furnished most eminent examples of zeal and industry,—yet it would in all likelihood be found that there was not an European corps in India in which there were not abundance of officers who, with the good sense and good feeling of Major SMITH, were at all times most anxious to find amusement or occupation for the men—the more intellectual and improving so much the better,—and abundance of soldiers most ready to undertake any researches of this sort that might be entrusted to them. It was in the conviction of this, that the scheme of the Society was originally started—they had never had the slightest hope of success save from amateur exertion, and in this they had unbounded faith.

Mr PIGOTT stated that he would, before leaving the meeting—which he was compelled to do,—beg to be permitted to ask the Secretary a question on a subject on which he was desirous of receiving information. The original scheme of the Society had been restricted to Tidal observations, with Meteorological observations as a subsidiary: for the publication of a certain number of these, of a specific character, Government had undertaken the charge,—but from the notice paper, and the piles of MS. on the table, it appeared that there were large masses of other observations the publication of which was contemplated by the Committee; and he wished to know from what quarter the expense of printing these was to be met. He was sorry to take up the time of the Society on the subject, but thought it was better that the matter should be cleared up now than that misunderstandings arise afterwards.

The SECRETARY said that, with the permission of the Society, he would endeavour to explain the matter in a manner that would, he hoped, be in so far satisfactory—it did not appear that the time of the Society could be better employed than in giving the explanations desired, or that a more fitting occasion than the present could have been selected. Mr PIGOTT was under a mistake in supposing the meteorological subordinate or secondary in importance to the tidal observations: they had always been treated, as would be seen by the letters of both parties, alike by Government as by the Society, as holding a perfect equality of footing. The cost of publishing the observations had been estimated at Rs 3000,

and this sum had been at once conceded by Government*: of this, Rs. 2400 had been assigned to the publication of the tidal observations alone, the tracings of which were at one time proposed to be given from the gauge. He was not authorized to speak for the Committee, and did not know that he explained their sentiments, but believed that it was now proposed to give the tidal returns in a simple tabular form, the cost of printing which would not in all amount to Rs. 500: Rs. 1900 were thus liberated for the other portion of the scheme, and this he believed would do much more than meet all their demands. But though it was true the Government had given this very handsome sum for a strictly specific purpose, he was well satisfied that the most liberal possible interpretation would be placed by them on the terms of the grant,—that all they had in view was the collection and diffusion of information on physical geography,—and that they would be delighted could the Society contrive by good management to have a balance over after printing the observations mentioned by them, to have this applied to the defrayment of the publication of other observations bearing on the same point, which imposed no outlay upon them save that of printing. Were it otherwise, however, it would be a matter of very small account, as would presently appear. The powers of the Committee on Physical Research were well defined and very restricted indeed. When the Society had ordered him (the Secretary) to draw up reports and prepare the observations for the press, the Committee was appointed to receive them, and, if approved of, to lay them before the Society: should the Society approve of them, they might then be published or otherwise disposed of as thought best. On this ground it was that the Sub-Committee's report had to-day been brought forward; and the printing of the Aden observations, which had been sanctioned from the first, and the charges of which fell on Government, was now being proceeded with. The other observations alluded to by Mr PIGOTT would be worked up into separate papers by the Secretary, as nearly as possible conformable with the others: these as they were got ready would be submitted to the Committee, and if approved of, be ordered for publication, like any other papers from any other parties, in so far as the state of their Transactions allowed: the charges of the printing of these might fall on the balance of the Government grant, were Government disposed to permit this; or if not so, on the funds of the Society. The Society had hitherto been in the habit of publishing meteorological observations from all parts of the world—from Karrack,

* The following was the resolution adopted by the Society in March 1848—[See Transactions, Vol VIII, p. xxv.]:—

"Resolved—That the Secretary do communicate to Government the result of its enquiry into the expense of printing, which will simply for one year's observations at seven observatories cost 3,000 rupees—exceeding the balance in the Society's hands; and submit that it could not, even with this sacrifice of the whole of its funds, offer to continue its aid in printing beyond one year. Since it appears from the reports of the British Association—vide No. 1027 of the *Athenæum*—that the Government is already charged by the Hon'ble Court to make these observations, the Society trusts that the Government will undertake the expense of printing, the Society being prepared to carry out its original proposition of superintending the observations."

To this, Government most promptly and liberally replied, taking on themselves the entire charge of printing the tidal and meteorological observations.—It might have been added, that at the time this estimate was made, Government had agreed, as the Society understood the matter, that the Tidal observations made at Colaba should, subsequent to December 1847, be published by the Society,—that they had since determined to print these along with the *magnetic* observations, which, it was said, would be *incomplete* without a *register of the tides*. This will probably liberate Rs. 100 or 200 more.

in the Persian Gulf, Scinde, the Deccan, Australia, &c.: it would be strange if they now began to decline them merely on the score of their being systematic and connected instead of desultory and disjointed. If it should be so, it would still matter little to science: he (the Secretary) should cheerfully proceed with the labour of collation, preparation, and reduction,—well assured that should the results of his endeavours fail to meet with the acceptance of the Bombay Society, they would be gratefully accepted, and eagerly published, by any one of a dozen of Societies elsewhere.

Mr PIGOTT said he thought in this view it would be better to write to Government on the subject, and ascertain whether they would restrict their grant rigidly to the purposes originally assigned to it, or allow it to be taken advantage of for the publication of other observations than those at present provided for.

The SECRETARY said it would be very expedient to correspond on the subject with Government when the papers in contemplation were in readiness—as yet they were dealing only with those specifically referred to: Government had had an infinitude of correspondence inflicted on them, and trouble occasioned them, never contemplated at the outset of the scheme, and it seemed a pity that they should be troubled with a reference on a point still remote and contingent, and which could be settled so soon as it appeared.

Mr PIGOTT said he hoped the Secretary's view would prove correct, and that it would all turn out as was desired.—And there the matter dropped.

A large collection of instruments of different sorts were exhibited: some were dissected and examined, and their peculiarities pointed out.

The papers of Mr RIGBY and Mr WATERSTON, which could not be read for want of time, were desired to be sent round to the Committee. These will be found published amongst the papers further on. [The Meetings of the Geographical Society are limited by those of the Asiatic Society, which take place just after: there was on this occasion matter sufficient before the former to have occupied the afternoon.]

The following Committee on Papers was elected—the same to act as a Committee on Finance:—Captain R. ETHERSEY, I. N.; Captain H. J. BARR; Major J. HOLLAND; S. S. DICKINSON, Esq.; Commander G. JENKINS, I. N.; and JOHN SMITH, Esq.

The Committee on Physical Research remains as before, with the exception of Commander MONTRIOU, and Mr WATERSTON, resigned.

The following gentlemen were proposed as Members of the Society by the Secretary, seconded by Captain J. P. SAUNDERS, I. N., and duly elected:—Dr R. WHITE, 3rd Bombay Cavalry, and MANOCKJEE NUSSERWANJEE, Esq.

The usual vote of thanks was then passed to the Chair, and the meeting separated.

THE Ordinary Monthly Meeting of this Society took place in their rooms, Town Hall, on Thursday, the 19th July. Present—The Hon'ble J. P. WILLOUGHBY, Esq., President, in the chair; Captain J. C. HAWKINS, I. N.; Commander G. JENKINS, I. N.; Revd. GEO. PIGOTT; Dr. J. W. WINCHESTER; NORMAN

OLIVER, Esq.; J. BURNES, M. D., K. H.; Colonel GEO. MOORE; Capt. H. J. BARR; Captain S. V. W. HART; and Dr. GEO. BUIST, Secretary.—The minutes of last meeting were read and approved of.

The Secretary stated that as much of the business on the notice list was matter of routine, and might be disposed of summarily in case they proved short of time, referred to a committee, or deferred to next meeting, it would be well to give precedence to the motion of Commander JENKINS.—This being assented to, Commander JENKINS read the following statement:—

"Mr President and Gentlemen,—I feel considerable diffidence in taking upon myself the position of proposing a motion, that this Society should record, and mark its high sense of the eminent service conferred on this Society by our late President, and on our country and mankind by them, while Surveyor-General of India. I feel diffident, from dreading that the cause I am trying to support will lose ground from not having a more able or influential advocate. Captain ROSS was elected President of this Society on the retirement from this country of his zealous and able friend, Admiral Sir CHARLES MALCOLM, whose Portrait adorns our rooms, and whose constant sympathy with all we do shows his heart is still with us. The services of Captain ROSS, in the cause of Science, Geography, and Navigation, are well known, and his name in Europe and America is honoured as the first Surveyor of the Age, whose Charts are so justly appreciated that in the darkest night, the heaviest gale, and on the most dangerous coasts, they are relied on by the Navigator with the same implicit confidence as you, gentlemen, rely on the correctness, when you read on the milestone your distance from a place. This important fact will be corroborated by members of this Society now present,—to whom, and to all of you, gentlemen, I appeal to do honour to this aged and great man. It has become a proverb, that in all ages of the world, war and not peace is the path to worldly honours and distinctions. Can we, therefore, wonder that in an empire so extensive as our own, the man who has conferred so great a service has been noticed with honor only by the Societies of Science? Let me, therefore, gentlemen, urge on this Society, to remember the labourer in the field of science, and feel pride that so much has been done to open, by members of this Society, and to lay before the world, the knowledge of Asia; for proud should we feel when we remember that BURNES, POTTINGER, CARLESS, WOOD, YOUNG, LEACH, HARRIS, HEDDLE, CHRISTOPHER, and many other eminent men, were members of this Society: and as an impetus to those who may follow us, allow me to solicit your sympathy, and that this meeting now take into consideration the object I have in view."

A pause of some length having followed, Commander JENKINS was asked whether he had no specific motion to bring before the Society: a simple resolution might be adopted, and yet nothing whatever come out of it. Commander JENKINS declined making any further motion, but left the matter in the hands of the Society.

The Secretary remarked that as matters presently stood, they had nothing specific to determine, or out of which any proceeding could arise: the custom of the Society on such occasions was to bring forward a series of resolutions, the first

affirming a fact or principle, the others pledging the Society to some act founded thereon, and concluding with the appointment of a Committee or executive of some sort to carry these resolutions into effect. That committees were sometimes directed to take certain steps, and then report to the Society what they had done up to a certain stage of the proceedings,—or they were directed to carry out the objects of the Society to their conclusion, and then report what had been concluded, and lodge the documents. It was usual, also, that the party bringing forward such measures should propose his own committee : if Captain JENKINS would now proceed in conformity with the usages, the principle of the matter was one on which all were agreed :—all were equally anxious to adopt any measure most conducive to the honor of their late President—it only remained to be declared what that measure should be.

As nothing arose out of these observations, and the Society seemed likely to wander into desultory discussion, it was suggested that a Sub-Committee, consisting of Commander JENKINS, Archdeacon PIGOTT, and Dr BURNES, should retire and draw up a special motion on the subject, while the routine business of the Society was being proceeded with.

The Secretary stated that before the Committee withdrew, he might perhaps be permitted to throw out some observations, without any view of founding a motion, on the subject on which all were so unanimously agreed. It had not been stated by Captain JENKINS whence the funds were to arise by which a testimonial was to be procured—it was presumed they would be from the private contributions of the members. In the case of the portrait of Sir CHARLES MALCOLM, the whole expense had been defrayed by private subscription, with the exception of a small balance taken from the funds of the Society to meet a trifling deficit. In the case of the monument to Dr HEDDLE, the Agricultural Society and Geographical Society had each voted the sum of Rs. 150 from their funds : the rest, amounting to above Rs. 2000, was raised by private subscription. Various of the friends and admirers of Dr HEDDLE who did not belong to either Society, and were not permitted to contribute to the general fund, having subscribed, their subscriptions were entrusted to the Society, and a separate monument erected from these, in name of the subscribers, to his memory, over his remains at MALCOLM PETH. In the case of Sir ALEXANDER BURNES, the whole amount had been contributed by the Society ; but this was a peculiar one, and the proceeding was opposed to the general tenor of their rules. And in the various cases in which the Asiatic Society had provided monuments to distinguished members—of which those of Dr MALCOLMSON their Secretary, General KENNEDY their Honorary President, were the most recent,—the entire amount had been raised by subscription ; and he was not aware of a single instance save the one referred to where a monument had been provided from the funds of any of the local Societies. He would now bring another matter before them—he had already called attention to it out-of-doors, in connection with what had been done by the Asiatic Society,—where the most fitting testimonial for Dr MALCOLMSON had been considered a Library of Books bearing his name, and referring to the favorite subject of his pursuits. The object usually was, on such occasions as the present, to be guided as to the kind of

memorial as far as possible by what they knew, or believed, to be the views of the party on whom honour was proposed to have been conferred; and he felt very confident that had it been possible to obtain the sentiments of Captain Ross, he would have considered that the highest compliment which most conduced to serve the interests of the Society, and to extend the researches, and encrease the knowledge, in the promotion of which he had acquired so much distinction, A library of books relating to these subjects, calculated for the use of members, and bound uniformly, designated the "Ross Testimonial," each volume bearing a suitable inscription, indicating the grounds on which the Society had conferred on Captain Ross the highest honours they had to bestow, would not only tend much more readily to extend the knowledge of what they had done, than any picture, while it would provide instruction and amusement to surveyors and prospective hydrographers—indicating the path that had been pursued by the most eminent navigators—the renown that attended it, and results to which it tended. He threw out these merely as suggestions for consideration—without making any motion on the subject. The Committee having withdrawn, the other business was proceeded with, and again suspended on their return, when the following resolution was put and agreed to unanimously:—"That a subscription be opened for the purpose of making a portrait of Captain Ross, the Honorary President of the Society—to be hung up in the Society's rooms; and that a committtee be appointed to carry this resolution out, and report progress at the next meeting."

The following subscriptions were set down on the spot:—

Portrait for Captain D. Ross, I. N., limited to Rs. 25.

	Rs.		Rs.
The Hon'ble J. P. Willoughby.....	25	Dr. Winchester.....	25
Dr. J. Burnes, K. H.....	25	Lieut. A. D. Taylor.....	20
Commodore Hawkins.....	25	,, Manners..... ...	10
Capt. R. Ethersey.....	25	Norman Oliver, Esq.....	10
,, H. J. Barr.....	25	Capt. S. V. W. Hart...	20
The Venerable Archdeacon Pigott.....	25	Commander G. Jenkins.....	25

It was stated that the Committee concurred in the sentiments set forth by the Secretary, but as Commander JENKINS seemed to think a portrait the best mode of giving effect to their views, they had deferred to him. Captain HAWKINS and other members expressed their concurrence in the Secretary's views; it was stated that with good management there ought to be a considerable balance over, as a copy of an existing portrait was all that could be looked for, and that with this balance a library might be provided in addition to the picture.

The Hon'ble J. P. WILLOUGHBY, Captain HAWKINS, Commander JENKINS, and the Secretary, were appointed a committee to make arrangements.

The MS. Catalogue of the Library was laid before the meeting and approved of. It was stated that for the present it must remain unprinted; it was sufficient to preserve for them a list of their books, and to enable any one to find what was desired.

A Catalogue of Maps, Charts, and Drawings, with the Maps, Charts, and Drawings, themselves, belonging to the Society, were laid on the table. A number of these were desired to be framed and hung up: the subject was referred to the Committee on Papers, with an intimation that a due regard should be had to economy.

The following Manuals were desired to be ordered :—DENT, BLENVILLE, and FRODSHAM, on Barometers; RIDDELL'S Manual for Magnetic Observation.

The amendments on the regulations, as assented to on the Circular, were adopted, with the exception of a slight alteration referring to the first regulation as to the designation of the Society.

Specimens of MAURY'S Wind and Current Charts were directed to be ordered. It was stated that there was no occasion for an entire set: a moderate sum should be assigned for their purchase, leaving the agent of the Society to select.

The following gentlemen were then proposed as Members of the Society, and unanimously elected :—

1.—Lieutenant J. J. POLLEXFEN—proposed by Dr GEO. BUIST, and seconded by Dr. J. BURNES, K. H.

2.—DHUNJEEBHOY FRAMJEE, Esq.—proposed by Dr. GEO. BUIST, and seconded by Capt. J. C. HAWKINS, I. N.

3.—JOHN RITCHIE, Esq.—proposed by Commander G. JENKINS, I. N., and seconded by Capt. H. J. BARR.

4.—Dr. J. L. KENNEDY—proposed by the Hon'ble J. P. WILLOUGHBY, and seconded by Commander G. Jenkins, I. N.

The following donations of papers, books, &c., were next laid on the table, for which the Secretary was directed to return the thanks of the Society to the donors :—

PAPERS.—By the Author, through Captain S.B. HAINES, I. N., Political Agent at Aden.—Tidal and Meteorological Observations taken at Shum Shum and Seerah Island &c., for the month of May 1849. By Sergeant W. MAYES—with a letter dated Seerah Island, the 15th June 1849.

By the Author.—Notice of the Climate of Phonda-Ghaut, as adapting it for a sanatory station. By Captain E. P. DEL'HOSTE.

By the Author.—State of the Thermometer in the shade at Peshawur, for the month of June 1849, dated camp Peshawur, the 1st July 1849. By Surgeon JOHN P. MALCOLMSON, 3rd Regiment Bombay Native Infantry.

BOOKS.—By the Bombay Branch of the Royal Asiatic Society.—Journal of the Bombay Branch Royal Asiatic Society, No. 12, Volume 3rd, for the month of January 1849.

By Government.—Prinsep's Useful Tables, Parts 1st and 2nd, for 1840 and 1846. With a letter from J. G. LUMSDEN, Esq., Secretary to Government, General Department, No. 2164, dated 29th June 1849.

By the Royal Geographical Society of London, through Mr. CANNON.—Journal of the Royal Geographical Society of London, Vol. 16th, Part 1st of 1846; Vol. 17th, Parts 1st and 2nd of 1847; Vol. 18th, Part 1st of 1841; and of the Royal Geographical Society and its labours.

By the Société de Géographie at Paris, through the Royal Geographical Society of London.—Bulletine de la Socié.é de Geographie, Tome 6 and 7 of 1846 and 1847.

By the Asiatique Societe at Paris, through the Royal Geographical Society of London.—Journal Asiatique ou Recueil de Memoires, Tome 3rd, No. 14, Mai 1844; Tome 5th, No. 24, Juin 1845; Tome 6th, No. 27, Septembre—Octobre 1845; Tome 6th, No. 28, Novembre 1845; Tome 6th, No. 29, Decembre 1845; Tome 7th, No. 30, Janvier 1846; Tome 7th, No. 31, Fevrier 1846; Tome 7th, No. 32, Mars 1846; Tome 7th, No. 33, Avril 1848; Tome 7th, No. 34, Mai 1846; Tome 9th, No. 42, Mars 1847; Tome 10th, No. 49, Octobre 1847.

By Government.—Journal of the Indian Archipelago and Eastern Asia, Vol. 3rd, Nos. 4 and 5, April and May 1849. With a letter from J. G. LUMSDEN, Esq., Secretary to Government, No. 2280, dated 13th July instant.

By the Secretary.—A History of the Sikhs from the origin of the nation to the battles of the Sutlej. By Capt. J. D. CUNNINGHAM.

LETTERS.—1. From Colonel J. R. JACKSON, Secretary to the Royal Geographical Society of London, dated 16th May 1849, acknowledging the receipt of Transactions of the Bombay Geographical Society from May 1844 to February 1846, and thanking the Society for the same.

2.—From Messrs SMITH, ELDER & Co. of London, dated 19th of May 1849, acknowledging the Society's letter of the 3rd April last, and in compliance with its instructions, advising of their having forwarded to Mr MAYES a copy of the Instructions of the Royal Society to the Antartic Expedition in 1839, and a copy of the same work overland to the address of the Society. Also informing that the Manual of Scientific Inquiry, edited by Sir JOHN HERSCHEL, is not yet published.

3.—From Dr R. WHITE, dated Sholapore, 30th June ultimo, acknowledging the Society's letter dated 26th June last, and requesting to convey his best thanks to the Society for the honor they have done him by electing him a member of the Society.

4.—From the Hon'ble J. P WILLOUGHBY, Esq, dated 4th July instant, acknowledging the Society's letter dated 28th ultimo, informing them that he has pleasure in accepting the honorable office of Honorary President of the Society, and requesting to communicate to the Society how highly he appreciates the distinction they have conferred upon him, and stating that no exertion on his part shall be wanting to promote the important objects for which the Society has been established.

5.—From Capt. N. H. THORNBURY, Secretary to the Military Board, dated 5th July instant, No. 4860 of 1849, acknowledging the Society's letter No 53, dated 29th ultimo, and requesting to be informed when the Thermometers were purchased, and to submit the bill prefrered against the Society.

6.—From JOHN SCOTT, Esq., Secretary to the Medical Board, No 1068, dated 7th July instant, returning the bill referred to in the Society's letter No 61 of the 6th instant.

7.—From Commodore S. LUSHINGTON, Commander-in-Chief of the Indian Navy, dated 7th July, intimating his acceptance of the office of Vice-President, assuring the Society how highly he appreciated the honour conferred on him; and assuring them that he should at all times be most anxious to exert himself to advance the interests of the Society, and promote the objects they had in view.

8.—From the Hon'ble J. P. WILLOUGHBY, Esq., dated 9th July instant, forwarding Captain DEL'HOSTE's Meteorological Observations on the Phonda Ghaut, dated 1st July instant, for the month of June 1849.

9.—From Captain N. H. THORNBURY, Secretary to the Military Board, dated 13th July instant, No. 5019 of 1849, intimating the inability of the Board to order the refund of rupees (24-3-7) twenty four, annas three and pies seven, paid by the Society to Government for four thermometers, pending further explanation.

THE ordinary monthly meeting of the Bombay Geographical Society was held in their rooms, Town Hall, at 3 o'clock on the evening of Thursday the 16th August. The following gentlemen were present:—The Hon'ble J. P. WILLOUGHBY, Esq., President, in the chair; Commodore S. LUSHINGTON, R. N., Commander-in-Chief I. N.; J. BURNES, M. D., K. H.; Commodore J. C. HAWKINS, I. N. NORMAN OLIVER, Esq.; Captain H. J. BARR; Captain THOS. WILLS; Professor JOSEPH PATTON; Commander G. JENKINS, I. N.; Captain R. ETHERSEY, I. N.; DHUNJEEBHOY FRAMJEE, Esq.; S. S. DICKINSON, Esq.; C. J. ERSKINE, Esq.; JOHN SMITH, Esq.; MANOCKJEE CURSETJEE, Esq.; and Dr GEO. BUIST, Secretary.—The minutes of last meeting having been read and approved of, the following report from the Committee on the "ROSS TESTIMONIAL" was read:—

REPORT OF THE SUB-COMMITTEE ON THE "ROSS TESTIMONIAL."

To the President and Members of the Geographical Society.

In compliance with the Resolution recorded at the Ordinary Monthly Meeting of the Society, held on the 22nd July, your Committee proceeded to receive Subscriptions for the "Ross Testimonial," and have now the honour to lay the list before the Society, already containing the amount of Rs. 1,504.

So many parties not connected with the Society expressed their anxiety to do honour to Captain Ross, that on the list will be found the names of a considerable number of Gentlemen not Members; and your Committee have now respectfully to recommend that the Subscription be made an open one, and these Subscriptions accepted.

Your Committee addressed the letter to Capt. Ross, copy of which accompanies this, requesting that he would accept the honour of Honorary President, and permit a Portrait to be provided with which to decorate our Rooms; and to both these requests a favourable answer was received.

The sum subscribed greatly exceeds that required for the Portrait, and a large balance is still expected to be raised. It will be for the Society to determine how this shall be expended in furtherance of the objects we have in view.

The following was the letter forwarded to Captain Ross—the enclosures referred to will be found in the reports of the Meetings of the Society for June and July:—

To Captain Ross, Indian Navy.

Sir,—The last communication I had the honour to transmit to you, by direction of the Bombay Geographical Society, intimated their wish that you should permit your resignation of the Office of President to be declined, as the Society could not suffer itself to forego the hope that they might yet enjoy the happiness of seeing you at their head. The Society subsequently determined to confer on you the highest honour they had it in their power to bestow—that of Honorary President; and to request of you that you would permit them to provide themselves with a Portrait of you, to be hung up in their Rooms, in testimony of the respect entertained of your accomplishments and abilities, of the value of your services to Science, and of the estimation in which they hold your personal worth.

In conveying to you the request of the Society to the effect just mentioned, I am directed to forward a copy of the address of Dr Burnes in proposing your election to the rank of Honorary President, and of that of Commander Jenkins in proposing the award of a Testimonial.

To these nothing need be added further than this—that in all that is there stated in your commendation, the Members of the Society cordially and unanimously concur, and consider that it would indeed be a difficult task to say anything in the way of compliment beyond what your merits deserved.

I have the honor to be, Sir, your most obedient servant,

Society's Rooms, Town Hall,
—— August, 1849.

George Buist,
Secretary to the Bombay Geographical Society.

Captain Jenkins then read the following address:—

Mr President and Gentlemen.

1. I feel much regret that I have again to appear before the Society advocating a different course to that which the Secretary of this Society supports.

2. My address at the former meeting, and the line of argument I felt it my duty to support, though not read at this meeting, may yet be fresh in your recollection, and will eventually, I hope, appear in our printed Transactions.

3. I have gained confidence from the feeling that has been displayed by the members of this Society in supporting my motion to do honor to Captain Ross, I. N., F. R. S., our Honorary President, and the distinguished Surveyor of the China and Indian Seas, by at once subscribing a larger amount than was required for the Portrait,—proving to me I had not overrated the distinguished position Captain Ross held in the opinion of scientific men.

4. I have felt considerable pleasure at the liberal and generous sentiments that have been addressed to me by the leading and most distinguished Native Gentlemen, who have a large amount of Capital embarked in the Commercial interests of India, who are closely connected with the Bombay and China trade, and who have consequently had an opportunity of testing the result of the scientific labours of the man you have determined to honour.

5. The liberal feeling that has been displayed has been considerably gratified by the hope that the money that will be raised for the Ross Testimonial will be laid out in a manner that will tend to increase the Commercial influence of this Port, by having in this Town Hall a copy of all the modern Charts and Hydrographical information that has been published by the Admiralty and the East India Company, which would be always readily available to the merchant and merchant service, to the Naval Officer, and even to the Government; for I am confident, Gentlemen, you cannot but be aware of the great difficulties we labour under in this important Naval and Commercial Port, should the merchant require to send his ship out of the most common track, as in the following instance: a merchant vessel which brought a cargo of Coal from England to Aden received instructions at that Port from the Owners in London, to proceed to California; from a want of knowledge of that Sea, she came to Bombay in vain for charts and information. The vessel was eventually wrecked.

6. Or should the Government require to send a Frigate either to protect trade and national interests, or search after some unfortunate vessel, either of our own flag, or that of an ally, supposed to have been wrecked on some distant coast, as in the three following instances—which, out of many, I have selected as being known to you all:—

1st. The H. E. I. C. Brig of War *Tigris* proceeding in search of the Crew of a vessel wrecked n Torres Straits, of which an account has appeared in the Transactions of this Society.

2nd. H. M. S. *Thalia*, which was sent from this station, commanded by my distinguished friend Captain Hope, in 1843, on a special duty to the mouth of the River Columbia and Oregon

Territory, where it was requisite for the national policy to lose no time, and at all risks to show the British flag on the coast of that distant portion of our Empire.

3rd. The H E I. C. Ship of War *Elphinstone*, ordered by H. M. Government on a most important service from Bombay to Port Adelaide and New Zealand.

In each of these instances, the officers intrusted with the command of these War Vessels were highly gifted men, and made all possible enquiries for information, and I can assure you Gentlemen, that they felt the want of such sources of information as it is now proposed to afford.

7. As a Naval officer, and one who has for many years closely attended this Society, I would strongly urge on your attention, Gentlemen, the great importance of taking advantage of the public feeling displayed at this moment, and which I have no doubt will receive the support of H. M. Government through the Admiralty, the Hon'ble the Court of Directors of the East India Company, of the Indian Governments, and of every British merchant who is connected with the East; and I beg to assure the Society, that the leading Houses look with great interest to the result of our decision; and the voice of my own Service will, I am confident, concur with my views.

Captain JENKINS concluded without any motion.

Captain HAWKINS then read the following observations:—

In rising to support the motion of Commander Jenkins, I would beg to observe, that Maps and Charts of the World would, in my opinion, be the most appropriate testimonial that a Geographical Society could vote on such an occasion, it being in honor of a member of the Society—one who has himself been so great a contributor in fixing a large portion of the most interesting portions of the Globe. These Charts might prove of the greatest benefit to Mariners proceeding to quarters of which charts are not procurable in India In seconding this proposition, to be taken from the funds after the picture has been paid for, will not preclude the selection of works on Hydrographical subjects, or others on scientific research, as there are reasonable hopes of sufficient funds being subscribed for all of these purposes.

The *Secretary* said that he had before mentioned to Commander JENKINS that he meant to propose the purchase of books in preference to Charts, and he hoped it would not be considered that there was anything factious in the opposition, or that there would be any acrimony in the discussion. Commander JENKINS had assured them that all the charts desired would be provided, through the Hon'ble the East India Company, by the French and British Governments; and if so, there was no occasion for providing the means of purchasing them: the surplus funds might be at once assigned for the purchase of books. On such occasions as the present the ends in view in providing a testimonial were two-fold—first, to see in what way the estimation in which the Society held the object of the testimonial could be manifested to himself, and made known to the world; and second, how this might, as a secondary consideration, be made to conduce to the advancement of the great general objects the Society had in view, in the promotion of which they were bound to suppose the object of the testimonial most deeply interested. Were Charts selected, they would remain hung up in the scanty room of the small apartments which formed their office—they would be seen by no one save those desiring to consult them: not ten persons visited their rooms a year beyond the Members of the Societies to which they belonged; and in all likelihood not one man in five years would ask for a sight of the charts. These treasures, however precious, would thus be buried—no one would ever think of them—they would neither answer the objects of a testimonial, nor serve in any way to promote the interests of Geographical Science. A well-selected library of books, on the other hand, duly blazoned outside with the arms of Captain Ross, and marked as the "Ross Testimonial" inside, inscribed with the reasons why a testimonial was bestowed, would indicate to every one who had access to the library that which was desired to be made public,—while the books themselves would afford instruction on the subjects, and promote a taste while they prepared the mind for the

researches in which Captain Ross had distinguished himself, and for which the Society had been brought into existence. They were all at one as to the end aimed at, but differed in the way it which it might best be attained—Commander JENKINS and Captain HAWKINS thought by Charts, but the Secretary thought by a library of books.—The proposition not having been seconded, was withdrawn.

It was then agreed that the paper of Commander JENKINS should be placed on record, but that the further consideration of the subject should for the present be deferred, until the whole subscription that might be looked for was realised, and the amount of balance after the Portrait had been provided was estimated, and an estimate of the cost of the Maps and Charts desired to be provided had been received. The question would then be taken up by the Society with all the facts before them.

It was stated that the Committee were in no way responsible for the heading of the Subscription *List*, which had been placed there, not only without their authority, but against the remonstrances of one of the members: they had acted on the instructions conveyed to them in their minute.

The Secretary remarked that publicity on one point alluded to had already done something for the Society, as would be seen by the following letter:—

SIR,—Seeing a paragraph in the *Times* paper the other day stating that the Bombay Geographical Society had sent home for copies of Lieut. Maury's *Wind* and *Current* Charts, I have copies of these Charts, and if you will accept the use of them you are welcome to them until you get your own out. Will you kindly favour me with your opinions of them.—Truly yours.

Bombay, 15th Aug. JAMES BANNATYNE, Commanding "*Glenelg*."

Dr Buist, Secretary Geographical Society Bombay.

The subjoined letter was then read by the Secretary:—

To JOHN POLLARD WILLOUGHBY, Esquire, President Geographical Society of Bombay.

SIR,—At a trial which will take place in the Supreme Court during the ensuing Term, it will be necessary to produce in evidence a letter dated on or about the 7th day of April last, written and sent by Dr Buist, the Secretary of the Geographical Society, to the Members of the Committee on Physical Research. I have the honor of addressing you for the purpose of being informed whether the Geographical Society will permit one of their Officers to produce at the trial the letter in question. I make this application to render a process of the Supreme Court unnecessary.—I have the honor to be, Sir, your very obedient servant,

Bombay, 15th August, 1849. HENRY RD. BURN, Solicitor.

On which the following resolution was proposed by Captain BARR, seconded by Captain ETHERSEY, and agreed to unanimously:—

"That the letter alluded to is not on the records of the Society, and they have no power over it. Mr Burn should therefore be informed, that, should he be of opinion that the document is one the production of which he can demand, he should apply to the Committee on Physical Research, of which Major Holland is Chairman."

This resolution being agreed to, the Secretary stated that as Committees found actual meetings in general very inconvenient, the business before them was discussed by Circulars, and remarks written down by each member: that this took the place of conversation round a table, and was equally private. From the written discussson arose the minutes, resolutions, or reports, of the Committee, which alone became the property of the Society when placed on its records. The Circulars and observations might be destroyed by the Committee the moment they had served their purpose. The Society had no right whatever to see them. In this case they had got a report: this was all they had any business with. This

was universally understood as the rule, and so far had it sometimes been carried, that in 1846 the Prize Committee of the Agricultural Society, of which Colonel JERVIS was President, and Captain ETHERIDGE Secretary, refused to show the Society their accounts. No man would accept the office of Secretary, or act as Member of Committee, but on the faith of such things being strictly private and confidential.

The following gentlemen were then proposed as Members of the Society, and unanimously elected:—

1.—James Stockham, Esq., Indian Navy—proposed by Commander G Jenkins, I. N., and seconded by Commodore J. C Hawkins, I. N.

2.—Venayekrao Jugonnathjee, Esq.,—proposed by Commander G. Jenkins, I. N., and seconded by Commodore J. C. Hawkins, I N.

3.—William Gratrix Allan, Esq.,—proposed by Commander G. Jenkins, I. N., and seconded by Captain H. J Barr.

4.—Major John Jacob, of the Artillery - proposed by the Hon'ble J. P. Willoughby, and seconded by Commodore S. Lushington, R. N.

The following papers, books, and letters, were laid on the table:—

By the author, through Captain S B. HAINES, I. N, Political Agent at Aden.—Tidal and Meteorological Observations as taken on Shum Shum and Seerah Island at Aden, &c., for the month of June 1849. By Sergeant W. MAYES; with a letter dated the 16th July, 1849.

By Government—Meteorological Journals from December 1845 to April 1489 from Kotree, Scinde; with a letter from J. G. LUMSDEN, Esquire, Secretary to Government, dated 31st July, No. 832 of 1849.

By the Author, through Major G. LEG JACOB.—Meteorological Observations for the month of May and June 1849; with two letters, viz., one from ANUNTA BALLALA, dated Sawunt Waree, the 21st July, and another from Major G. LEG JACOB, dated 22d July, 1849.

By Mr THOMAS CALDECOTT—Meteorological Observations taken at Trevandrum, from January 1848 to April 1849; with two letters dated Trevandrum, the 31st July, 1849 viz., one from Mr CALDECOTT, and another from F NARRONNIAK. The address of this packet had got rubbed off, and it had remained at the post office since the 10th June: observations of 1st July had since been received.

BOOKS.

By the British Government—Magnetical and Meteorological Observations, St Helena, from 1840 to 1843 (in three books)

By the Royal Geographical Society of London, through Mr J. T. BELL.—The Journal of the Royal Geographical Society of London, Vol 18th, part 2d of 1848.

By the Societé de Geographie de Paris, through the Royal Geographical Society of London.—Bulletin de la Societé de Geographié, Tome 8th and 9th of 1847 and 1848.

By the Societé de Asiatique de Paris, through the Royal Geographical Society of London—Journal Asiatique ou recueil de Memoires, &c. &c. Tome 10, No. 50, Novembre, Decembre, 1847; Tome 11, No. 51, Janvier; Tome 11, No. 52, Fevrier; Tome 11, No. 53, Mars; Tome 11 No. 54, Avril, Mai; Tome 11, No. 55, Juin 1848.

LETTERS.

From Major JACOB, Sawunt Warree, with an enclosure from ANTOBA BALLOO, in charge of the Observatory, requesting further supplies of instruments, and pointing out the manner in which the establishment might best be worked out—enclosing a series of observations on the atmospheric disturbances of 1849.

From Captain JACOB, Company's Astronomer, Madras, enclosing a complete series of observations for 1848, and disturbances for 1849 up to the 28th July.

From Captain THUILLIER, Deputy Surveyor-General, Calcutta, with observations up to the 1st July 1849, in continuation of the series for twenty-three years previously sent.

From Dr FORD, with a beautiful series of observations from Hoshungabad for the year 1848, and up to July 1849.

From Dr GIBSON, with disturbance observations for 1849.

From Captain MEDOWS TAYLOR, with Monsoon observations from the Nizam's Dominions—for 1849.

From Major PARKINSON, with Ombrometrical observations at Sion Fort, taken twenty five feet above high-water mark—on the glacis, ninety feet, and on the top of the flagstaff, one hundred and eighty feet above high-water.

The following letter was received in answer to No. 39, printed in page IX :—

No. 32 of 1849.

From Commander C. W. MONTRIOU, I. N., in charge of the Observatory.

To Commodore STEPHEN LUSHINGTON, Commander-in-Chief Indian Navy.

SIR,—I have the honor to acknowledge the receipt of a Memorandum of your Secretary, No. 1229, dated 19th June, 1849, with its enclosures, which are herewith returned, directing me to furnish information as to the Aden Tidal Observations.

In answer I have the honor to state for the information of the Right Hon'ble the Governor in Council, that the Meteorological Observations (as far as they extend over the year 1846,) made at Aden, together with nineteen days Tidal observations made in the same year, have been reduced, and are now passing the press, for the purpose of being appended to the volume of Magnetical and Meteorological Observations made at the Observatory Colaba, by Mr ORLEBAR, during the year 1846, the printing of which is now completed. The observations in an unreduced state, both Tidal and Meteorological, made at Aden during 1847, have likewise been received, and will be published in the volume of the Colaba Observations for 1847, now passing the press, unless the Government should see fit to direct otherwise. The Geographical Society having taken charge of the Aden Observations, since January 1848, no further papers have been sent to the Observatory from that station.

With reference to the first paragraph of the letter from the Secretary to the Geographical Society, to Lieutenant Colonel MELVILL, Secretary to Government, No 39, of 1849, dated 16th May, in which it is stated that the Geographical Society have just received printed copies of the Tidal Observations made at Colabah for 1846, 1847, and 1848, I beg permission to state, that the observations in question were forwarded by me to the Geographical Society, with a letter dated 20th of March 1849, No. 14, the receipt of which was acknowledged by them in a letter from their Secretary, No. 20, of 1849, dated 26th March.

I have the honor to be &c. (Signed) C. W. MONTRIOU,
Commander I. N., In Charge of Observatory.

Colaba Observatory, June 29th, 1849. (True Copy) J. G. LUMSDEN, Secretary to Government.

NOTE *by the Secretary*.—The Tidal Observations here referred to were laid before the Meeting of the Society on the 22nd March,—see report previous number, page lxxiv.—and acknowledged, as stated by Commander Montriou. The Secretary was then desired to write to Government the letter No. 39 of 1849, dated 16th May—printed in page ix.

The letter was accordingly drafted immediately, and the draft sent round to the Committee on Physical Research for approval. It was accompanied by a large mass of other papers and documents, which the Committee took some time to examine: some further delay was occasioned by an extract from a private circular, strictly confidential, to the Members, having been made by a Member, and placed in the hands of a party in no way connected with the Society for the purpose of being made the foundation of an action at law against the Secretary Commander Montriou desired the papers to be sent to him a second time, and was the last of the Members in whose hands they—the draft included—were. The letter meant to have been forwarded in March was not sent in till May The word "just" as originally written, was retained whereas "already" ought to have been used. I have given this explanation in justice to myself, as offence seems to have been taken at the result of an oversight. The letter was not in reality in the slightest hurry, and I was still in hopes that the reply to the application made under date 2nd April, on the subject of the Aden Observations, might have rendered its dispatch unnecessary; it having been subject of unceasing pain and regret that I should have been so often compelled to trouble Government on matters so trivial as those which occupy so prominent a place in the correspondence. The above letter of Commander *Montriou* gives no answer to the request contained in the previous one, which had been left unnoticed by Government.

From DHONJEEBHOY FRAMJEE, Esq., dated the 28th July ultimo, acknowledging the Society's letter No. 72 of 1849, and requesting his best thanks to be conveyed to the Society for his having been elected a member.

From JOHN RITCHIE, Esq, dated 28th July ultimo, acknowledging the Society's letter of the 26th July last, and stating that he feels deeply sensible of the honor conferred upon him, and will at all times feel happy to be serviceable to the Society if he can in any way assist and advance their interests in promoting those important researches which it has in view.

From Colonel G. P. LEMESSURIER, dated the 7th instant, requesting to be informed whether private individuals are allowed to send for instruments from England through the Geographical Society, and if so, to insert the name of Captain GEO. ROBERTSON, of the 26th Regiment N. I., for a "*Dry and Wet Bulb Thermometer.*"

From Corporal ROBERT LEACH, dated Kurrachee, 12th July ultimo, forwarding Meteorological Observations, and requesting to be furnished with instruments and schedules for a more regular and scientific series of observations at Kurrachee.

The Secretary stated, in reference to Captain MONTRIOU's letter, that the Aden Observations in the hands of the Society up to the 1st of July 1849 had all been corrected and reduced, and were now in the printer's hands: they had been got direct from Aden, subsequently to the dispatch of their letter to Government asking for an inspection of the original papers for 1847. So many of these as were desired had been prepared for the press, and the bulk of those for 1848 had already been thrown off: the printed sheets were laid on the table.

The best thanks of the Society were directed to be conveyed to the several donors abovenamed; and after a vote of thanks to the Chair, the meeting separated.

THE ordinary Monthly Meeting of this Society was held in their Rooms, Town Hall, on Thursday the 20th Sept., 1849, at 3 o'clock P. M. *Present*:—The Honorable J. P. WILLOUGHBY, Esquire, President, in the Chair; Commodore S. LUSHINGTON, R. N., Commander-in-Chief I. N.; J. BURNES, M. D, K. H, Physician-General; Major J. HOLLAND, Deputy Quartermaster General; A. MALET, Esq., Secy. to Govt.; NORMAN OLIVER, Esq.; Ven'ble GEORGE PIGOTT; Capt. S. V. W. HART; H. GIRAUD, Esq, M. D; B. A. BREMNER, Esq., M. D.; Capt. H. J. BARR; Professor J. PATTON; Dr. J. W. WINCHESTER; Lieut. A. D. TAYLOR, I. N.; DHUNJEEBHOY FRAMJEE, Esquire; VENAYEKRAO JUGGONATHJEE, Esquire; S S. DICKINSON, Esq.; JOHN SMITH, Esquire; and G. BUIST, Esq., LL.D., Secretary.—The minutes of the last Meeting having been approved of and adopted, the following letter was read. It was in reply to the address of the Society to their Venerable President, Capt. DANIEL ROSS, and was written by his daughter:—

TO THE PRESIDENT, VICE-PRESIDENT, AND MEMBERS, OF THE BOMBAY GEOGRAPHICAL SOCIETY.

GENTLEMEN.—The continued illness of my father utterly incapacitating him from answering the address you did him the honor of presenting, it devolves on me, as the sole member of his family present, to return you my heartfelt thanks for the honor conferred on him, which I am sure will be gratefully acknowledged by all connected with him. The notice you have taken of his labours has been the cause of great satisfaction.

I have the honor to be, gentlemen, yours obliged and grateful,

Colaba, 9th Sept. 1849. ELIZA SEATON.

Dr BUIST rose and said that the first business to be laid before the meeting was the Petition of a Purvoe in their employment for a gratuity of 40 Rupees per mensem for four months, as he was about to be discharged. One or two of the members objected to the gratuity, but on the motion being proposed by the Chairman, seconded by Dr. BURNES, and put to the vote, it was carried, without a division,—that the gratuity prayed for in the petition be granted.

The Secretary remarked that it was but just to the man to state that he had always performed his duties diligently, and to the best of his ability, but the increasing and important business of the Society demanded the services of a more able hand, and there was therefore no choice left,—another must be employed.

The following report of the Committee on Physical Research was read by the Secretary:—

1. In conformity with the recommendations in last report, Major JACOB at Sawunt Warree, has been supplied with the large Wind and Rain-Gauge by NEWMAN, on Mr OSTLER's plan; and the Tide-Gauges for Vingorla, Kurrachee, and Porebunder, have been despatched, with schedules and directions. The large Tide-Gauge by BUNT has, in conformity with the former resolution of the Society, been retained at the Presidency.

2. The Manual on Physical Research, published by the Admiralty, has been received. The extra copies ordered by the Society have been disposed of, and, in consideration of the demand for them, the Committee respectfully requests that ten additional copies, or such other number as the Society may consider proper, be ordered out by the Cape, for the use of those requiring them. The Manual has been prepared by a body of the first philosophers of the age,—for the use chiefly of the Medical Officers of the Royal Navy,—gentlemen who are in constant intercourse with men of science at home, and have all the scientific resources of the country at their command. It is in many respects ill-suited for the objects the Geographical Society has in view, and the parties from whose exertions the most valuable service has been received and is expected, by the Society,—are not possessed of the accomplishments the existence of which is assumed, and have not the means of availing themselves of the advantages in most cases at the command of those for whom the Manual is intended. On these grounds the Committee have not found in the Manual of the Admiralty the assistance they expected, and the Secretary is now advancing rapidly with a hand-book, in part compiled from a variety of sources, and in part prepared by himself, such as is considered likely to meet the views of the Society, and the wants of local investigators.

3. The cordiality with which the scheme of physical research has been taken up in nearly every quarter and the hearty co-operation that has been almost invariably received is considered by your Committee matter of great congratulation. The observations from Trevandrum by Mr CALDECOTT have been forwarded complete for the whole of 1848, and up to the 1st August 1849, under official cover from General CULLEN. Those from the Surveyor-General's Office, Calcutta, have been completed from 1828 to August 1849. From Lucknow 1847 has been received complete—1848 and 1849 are daily expected. These are forwarded by Colonel SLEEMAN, and are occasionally accompanied by very valuable commentaries by that distinguished officer himself. From Madras we have registers up to 1st August 1849, supplied by our old fellow-labourer, Captain JACOB, in continuation of those forwarded by Captain WORSTER.

4. Mr MAYES and Mr LEACH continue to distinguish themselves at Aden and Kurrachee by the zeal and industry with which they exert themselves, and the value of the assistance they render to the cause. The Commissioner for Scinde has kindly undertaken to permit all papers to and from Mr LEACH to pass free under official cover. Mr MAYES has of late been suffering severely from sickness, and is about to solicit his recal from Aden. By the end of 1849, the Society will be in possession of two years of Tidal and three of Meteorological observations from Aden, surpassable only in copiousness, accuracy, and perfection, by those provided by regularly organized and endowed establishments.

5. Mr MAYES, having been provided with an extra Barometer, is now pursuing an investigation of peculiar delicacy and interest, in reference to the relative fluctuations of the Atmosphere on Seerah Island, 187, and on the summit of Shum Shum nearly 800 feet above the level of the sea: the isolation of the Peak, and its elevation above Seerah from which horizontally it is not two miles distant, renders the locality particularly appropriate for such enquiries.

6. A large and varied collection of very accurate and valuable observations has been received from Dr FORD, at Hoshungabad, a locality which in some shape connects the observations at Calcutta and Bombay together. From Dr MURRAY, Woosung, China; Mr PYE, Futteghur; Dr HINTON, Ferozepore; and Dr MALCOLMSON, Peshawur; large and valuable reports have also been received.

7. The Govt., in declining permission to the Committee to consult the MSS. or printed sheets of the Bombay or Aden Observatories for 1846-47 and 1848,—an inspection of which was mentioned as peculiarly desirable for the determination of the normal state of the climate,—intimated that Commander MONTRIOU would give what assistance he could to the Society not incompatible with the speedy transmission of the Observatory Reports through the Press; and being on this applied to for extracts from the Colaba Reports of 1849, an immediate answer was received on the 11th June, assuring the Society of all the assistance desired by them. The Society had offered to get extracts made from them, by permission of Commander MONTRIOU, for themselves, or to pursue any other course most agreeable and least troublesome to the Observatory. No extracts have, up to the present time, been received. Just after it had been resolved to apply to Government for an inspection of the Aden Records for 1846 and 1847, the Committee learnt that the originals of the latter of these, at all events were still at Aden; and, to save possible loss of time, or risk of disappointment, they were applied for, through Captain HAINES, and immediately received. So much of them as was essential for comparison of the pressure temperature, and moistness of the air, were immediately prepared for publication, and have since been passed through the press.

8. The P. and O. S. N. Company have carried out to the fullest extent, the most liberal offer made by them to the Society, and parcels of considerable size—reports, books, and sets of tables—have been taken charge of by them for London, Ceylon, Madras, Calcutta, and China, without any charge whatever. Captain GRIBBLE writes from London highly approving the plan of providing a supply of instruments, and intimating that he had applied to Mr ADIE for a supply of Barometers, to be placed under charge of Captain MORESBY, on the same pattern as those ordered by the Society, which, if found satisfactory, would be generally introduced.

9. Though various sets of observations are ready for the press, those made at Aden in 1847-48-49 have alone as yet been passed into the printer's hands, reduced and prepared in a shape as nearly allied as circumstances permitted to the best models supplied by England, as already approved of by the Society. The pressure, temperature, and moisture tables are all for 1847 that have as yet been passed through the press, these being considered of the utmost importance for the speedy establishment of the normal state of the climate More was not ventured on, as the Society had been informed by Government that the full reports from Aden would appear along with those of the Observatory. A copy of a letter from Commander MONTMOU, forwarded by Government, intimates that these remain unreduced, and may, if it so pleases Government, be placed at the disposal of the Society. Should Govt decide to this effect, the residuary observations for 1847, omitted in their proper place, can easily be taken in at the commencement of those for 1849, and will render the entire record more uniform and complete than it otherwise could be made. The printing of the observations for 1848 is far advanced, and those for 1849, up to the 1st August, are all ready for the press, and will be printed off at the close of the year. These operations, tedious and tardy as they are, can, at present, be proceeded with with the greater celerity, as the whole of the reports of the meetings of the Society, up to the present date, and of the papers at its disposal, ordered for publication, are in type.

10. In conformity with the recommendation in last report, the Committee have collected, indexed, and put together for reference, all the papers belonging to the Society connected with the present scheme of Physical Research. These they now beg to place in the hands of the Society.

11 The Secretary having been directed by the Committee, as set forth in last report, and assented to by the Society, to report to the Committee from time to time as to the state of their arrangements and proceedings, the Committee beg to lay his first report before the Society, as also a memorandum on the subject of Barometers, drawn up when the order for Mr ADIE was prepared, the views of which, in reference to the portable instruments by NEWMAN, will be found to be similar to those entertained by Captain SHORTREDE, as represented by Mr MAYNE.

12 Letters have been received from Government, intimating their purpose of obtaining Meteorological information through the agency of the various Civil Surgeons throughout the Presidency, to be placed at the disposal of the Society, and requesting that instructions be prepared for their use. The contemplated arrangement is one of the very highest importance

13. It seems to your Committee ground of the utmost gratitude and congratulation that the matter should now be thus taken up by Government; so that, with comparatively little expense or trouble, we shall speedily be enabled to complete a network of observatories all over the country, calculated to elicit the very information the Society was most anxious to procure.

(Signed) J. HOLLAND. R. ETHERSEY. J. PATTON. G. BUIST.

It was proposed by Commodore LUSHINGTON, and seconded by Dr BURNES—

"That the report of the Committee on Physical Research, just read, be received and adopted."

Moved by the Chairman, and seconded by Dr BURNES—

"That the cordial thanks of the meeting be given to the Committee on Physical Research for the report they had furnished."

The motion of which notice had been given by the Revd. Mr. PIGOTT, came next to be discussed.

"That the Committee of Physical Research be instructed that the Society considers all the Committee's proceedings, minutes, correspondence, and communications, as its property; and requests that they may be carefully preserved, and placed among the records of the Society, together with the Committee's reports.—that Members of the Society may be enabled to avail themselves of the Committee's labors in detail."

The Revd. Gentleman then read a letter from Dr MOREHEAD. It was as follows:—

Bombay, 19th September, 1849.

SIR,—I regret much that unavoidable duty will prevent me being present at the Meeting of the Geographical Society, to be held to-morrow, for I am very desirous of having the opportunity of supporting Mr. PIGOTT's motion relative to the records of the Physical Committee. I am so, from its bearing on the general question of the preservation or not of the records of Committees, and of the minutes of members of Committees—a question in regard to which, I am given to understand, doubts are entertained in the Geographical Society.

During the last twelve years I have been Member and Secretary to many Committees in Bombay, and have always acted under the conviction that my own minutes, and those of my colleagues, were preserved. I would most certainly have declined sitting on any Committee on any other terms than these.

I shall feel obliged by your doing me the favor of communicating this letter to the Meeting of the Society to be held to-morrow.—I have the honor to be, Sir, your most obedient servant,

C. MOREHEAD.

To the Secretary to the Geographical Society, Bombay.

The following resolutions by the Hon'ble the Chairman were put as an amendment:—

Resolved.—That it appears to this Meeting that the Society have no power over the proceedings or records of a Sub-Committee until they have presented their report, when that report, and whatever documents accompany it, become the property of the Society.

2nd That it further appears to this Meeting that in the discussions which take place in a Sub-Committee, much may often occur that does not require to be recorded, and that the Committee alone can determine where to draw the line. But when in Committee a member has formally recorded a minute or other document, it cannot be withdrawn without the consent of his colleagues, though it must be manifest that in a Committee, cordially and unanimously working in furtherance of the cause of Science a case can scarcely be imagined where the request of a member to withdraw or amend a minute would be refused.

3rd That it appears to this Meeting that, until a Committee or Sub-Committee has reported to the General Society, no individual member of such Committee can give publicity to, or make use of, its records or proceedings.

The amendment was seconded by Dr BURNES, and carried by a majority of thirteen to three. The following was the

STATE OF THE VOTE ON MR WILLOUGHBY'S AMENDMENT:—

For Mr PIGOTT'S *Motion*.—1. The Venerable the Archdeacon PIGOTT.—2. N. OLIVER, Esq, Assistant Master Attendant.—3. J. TAYLOR, Esq., Lieut. I. N.

For Mr WILLOUGHBY'S *Amendment*.—1. The Hon'ble J P. WILLOUGHBY, Esq., Member of Council.—2. Capt. S. LUSHINGTON, Commander-in-Chief of the Indian Navy.—3. A. MALET, Esq., Secretary to Government.—4. Dr J. BURNES, K. H., F. R. S., Physician Genl.—5. Dr WINCHESTER.—6. Major HOLLAND.—7. Dr GEORGE BUIST.—8. Dr GIRAUD.—9. Captain S. V W. HART.—10. Dr B. A. BREMNER.—11. Captain J. BARR.—12. Professor J. PATTON.—13. DHUNJEEBHOY FRAMJEE, Esq.—14. VENAYEKRAO JUGGONATHJEE, Esq.—15. S. S. DICKINSON, Esq.—16. JOHN SMITH, Esq.

The following letters and papers were laid on the table. The consideration of them was deferred till next meeting.

PAPERS.

By the Author, through Captain S. B. HAINES, I N, Political Agent at Aden.—Tidal and Meteorological Observations as taken at Shum Shum and Seerah Island, at Aden &c, for the month of July 1849. By Sergeant W MAYES, with a letter dated Aden, the 14th August 1849.

By the Author.—Meteorological Observations as taken at Kurrachee, by Corporal ROBERT LEACH, for the month of July last.

From WOOSUNG.—Atmospheric pressure at the Turning Points of the Barometer, corrected for Temperature at each observation, on the 7th and 22nd May, and 5th and 22nd June 1849.

By Captain E. P. DEL' HOSTE.—Meteorological Register from Phoonda Ghat, for the month of August 1849, with a letter dated 11th September 1849.

BOOKS

Bought from SMITH, ELDER and Co., of London.—Layard's Nineveh in 2 vols; Illustrations to ditto, for £ 14 13s. 6d., with a letter dated 19th July 1849.

By the Hakluyt Society, through SMITH, ELDER, and Co, of London.—Voyage towards the North West, published in 1849.

By the Medical and Physical Society of Bombay.—A copy of No. 9 of the Transactions of the Medical and Physical Society of Bombay, with a letter dated 5th September 1849.

By Government.—The Journal of the Indian Archipelago and Eastern Asia, vol 3rd, No. 6, for June 1849, with a letter from J G. LUMSDEN, Esquire, Secretary to Government, General Department, dated 7th September, No 3 29 of 1849.

By Captain P T FRENCH through Capt. S V. W. HART.—Memorandum illustrative of a Sketch Map of the route from Tankaria Bunder to Rutlam in Western Malwa, with the Map.

LETTERS.

From SMITH ELDER and Co dated London, the 19th of July 1849, acknowledging the Society's letters of the 10th and 12th May 1849, the former enclosing bill for £ 6-4s. 4d at 30 days' sight, which on realization will be duly placed to their credit. Also advising of their having forwarded per Steamer, of this date, a package, containing Layard's Nineveh, and also of the illustrations to ditto, and a copy of the Hakluyt Society's publications (voyages towards the North West)

From Messrs. ADIE and Son, dated Edinburgh, the 1st August 1849, acknowledging the Society's letter of the 25th June last, enclosing Bill on London at 6 months' sight for £ 50, on

account of an order for instruments for the Society, and informing that no time shall be lost in forwarding them to India. Within two months from this date Mr. ADIE hopes to be able to send them all off, and promises that every attention shall be paid to the instructions conveyed to him in the Society's letter.

From HENRY GRIBBLE, Esq., dated London, the 7th August 1849, acknowledging the Society's letter, and informing that the Directors of the Peninsular and Oriental Steam Navigation Company are very glad to hear that the Society had adopted measures to keep up a stock of Instruments; and that an order had been given to Mr. ADIE for a supply of Barometers on the plan of the Society, to be placed under charge of Captain MORESBY, with the view of their being similarly disposed of.

From J. W. LAIDLAY, Esquire, Secretary to the Asiatic Society of Bengal, dated 10th August 1849, acknowledging the receipt of the Society's letter of the 11th July last, and expressing the pleasure they feel in assenting to the exchange of works proposed by the Geographical Society of Bombay, and informing that a copy of their researches as far back as the volumes on hand extend, will be furnished by the first ship, as also a copy of the Journal, and promising to forward these works in future as published.

From Dr GIRAUD, M. D., dated 24th August 1489, requesting the Secretary to obtain the sanction of the General Committee of the Society to allow him to resign his seat as a Member of the Committee on Physical Research.

From WILLIAM G. ALLAN, Esq., dated 24th August 1849, acknowledging the Society's letter of the 24th August last, intimating his election as a member of the Geographical Society, and availing himself to express his gratification for the honor which has been conferred upon him.

From J. STOCKHAM, Esq., I. N., dated 30th August 1849, acknowledging the Society's letter dated 20th August, No 71 of 1849, and returning his best thanks for the honor conferred on him for his having been elected a member of the Geographical Society.

From J. G. LUMSDEN, Esq., Secretary to Government, General Department, dated 12th Sept. No 3069 of 1849, acknowledging the Society's letter of the 23rd July last, and intimating that should the Society wish to have any of the Maps enumerated in the accompanying list one of each will be furnished. Also stating that Government do not possess any list or catalogue of the nature specified in the 2nd para of the Society's letter under reply.

From J. W. LAIDLAY, Esq., Secretary to the Asiatic Society of Bengal, dated 29th August 1849, intimating that a case of Books is despatched per Ship *Elizabeth Ainslie* for the Bombay Geographical Society, as advised in his letter of the 16th August 1849. Mr. Laidlay also begs to offer to the Society a copy of his edition of "Tanian."

From R. K. PRINGLE, Esq., Commissioner in Scinde, dated Kurrachee, 1st September instant, acknowledging the receipt of the Society's letter to the address of Mr INVERARITY, and expressing his pleasure in acquiescing in the request therein expressed.

From RAMCHUNDER RAO APPA, Chief of Jumkundee, dated September 4th, expressing his intention of taking Meteorological observations, and requesting information regarding necessary instruments.

From ROBERT LEACH, dated Kurrachee, 1st September instant, stating his wish to have an Anemometer and Hygrometer, and his ability to make a series of Magnetic observations, if he had the necessary instruments.

From J. M. KNAPP, Esq, Civil Surgeon, dated Nassick, 7th September, instant, requesting information regarding prices &c., of the Society's instruments, and requesting his name to be put down for a copy of the Manual of Research about to be published under the auspices of the Society.

From J. DAUN, Esq., dated Rutnagherry, 8th September, instant, requesting his name to be put down for a copy of the "Manual of Scientific Enquiry," about to be published. &c &c.

From the Hon'ble Sir ERSKINE PERRY, Kt., dated 11th September instant, asking for a copy of Sir JOHN HERSCHELL's Manual, &c. &c.

From Major-General W. CULLEN, dated Trevandrum, 1st September instant, regarding rain, winds, height of the Barometer, &c. &c.

From Major-General W. CULLEN, dated Trevandrum, 26th August ultimo, regarding the Geological Structure of Cochin and the Malabar Const. &c. &c.

From Mrs ELIZA SEATON, dated 20th September instant, returning heartfelt thanks for the honor conferred on her father, Captain D. ROSS, I. N.

No. 3878 of 1949.

From A. MALET, Esq., Chief Secretary to the Govt. of Bombay.

To GEORGE BUIST, Esq. L. L. D.,
Secretary to the Bombay Geographical Society.

Dated 18th September 1849.—Political Department.

Sir,—I am directed by the Right Honorable the Governor in Council to transmit to you, for the purpose of being laid before the Committee of the Bombay Geographical Society, copy of a letter addressed by me, under date the 5th July last, to the Revenue Commissioners of the Northern and Southern Divisions, and of their replies, dated the 9th idem and the 25th ultimo, on the subject of obtaining periodically Meteorological observations and returns from the several stations under this Presidency.

2. It being the intention of Government to furnish the Bombay Geographical Society with copies of these returns as received, I am desired to convey to you the request of His Lordship in Council, that you will have the goodness, at your convenience, to submit a plain and simple form for uniform adoption throughout this Presidency, accompanied by a short manual of instructions, for the guidance of the officers at the different stations to whom the above duty will be entrusted.

I have the honor to be, Sir, your most obedient servant,

Bombay Castle, 18th Sept., 1849. A. MALET, Chief Secretary.

No. 2908 of 1849.

From A. MALET, Esquire, Chief Secretary to Government, Bombay.
To A. N. SHAW, Esq., Revenue Commissioner Northern Division.
Dated 5th July, 1849.—Political Department.

Sir,—I am directed to intimate to you that it occurs to the Right Honorable the Governor-in-Council, that much valuable Meteorological information would be obtained if the weather reports, which are annually submitted to Government during the monsoon months by the local revenue authorites, were for the future in addition to the matter these at present contain, made to include notices of all Thunder, Hail, and Dust-storms, of all unusual disturbances of the atmosphere, with the day and hour of their occurrence, the monthly means and extremes of temperature, and fall of rain, &c. &c.

2. In order that you may by made aware of the nature of the report which would be acceptable to Government, I am directed to enclose, for your information, copy of a Meteorological Report for the Sattara Territory, for the year 1848, accompanied by tabular statements, prepared by Dr MURRAY, Civil Surgeon at *Sattara*.

3 I am directed to request that you will favor Government with your opinion as to the feasibility and advantages of the proposed scheme. I have the honor to be, &c

Bombay Castle, 5th July, 1849 (Signed) A. MALET, Chief Secretary.

No. 2909 of 1849.

To E. H TOWNSEND, Esq., Revenue Commissioner, Southern Divinsion.

Sir, (The same as above)

Bombay Castle, 5th July, 1849. (Signed) A. MALET, Chief Secretary.
(True Copies) A. MALET, Chief Secretary.

No. 1350 of 1849.

From A. N. SHAW, Esq., Revenue Commissioner, Northern Division.
To A. MALET, Esquire, Chief Secretary to Government, Bombay,
Dated 9th July, 1849.—Political Department.

Sir,—With reference to your letter of the 5th instant, No. 2908, intimating that much valuable Meteorological information would be obtained if the weather reports which are annually submitted to Government during the monsoon months, by the local Revenue authorities, were for the future in addition to the matters these at present contain, made to include notices of all Thunder, Hail, and Dust-storms, of all unusual disturbances of the atmosphere, with the day and hour of their occurrence the monthly means and extremes of temperature, and fall of rain &c., I do myself the honor to state, for the information of the Right Honorable the Governor in Council, that I shall immediately communicate the subject to the Collectors of this Division, and take steps to meet the wishes of Government; but at the same time as his Lordship in Council has done me the honor of requesting my opinion on the feasibility of the proposed scheme, I venture to suggest that the Meteorological report should not be mixed up with periodical returns furnished by Collectors of the state of the weather during the monsoons; but that the Civil Surgeons at Stations and Jails should be required to furnish to the Collector a quarterly Report, similar to that prepared by Dr MURRAY, at Sattara, to which I would propose to add a column, showing the existence or otherwise of any epidemic disease in the district; and that the return should be forwarded through this Department to Government by the Collector, with any remarks that may occur to him.

2. If this suggestion be approved by his Lordship in Council. Dr BUIST, or some other gentleman learned in these matters, may be solicited to mention the dates on which these periodical returns are to be furnished, so that they may coincide with similar reports drawn up at the Observatory. I have the honor to be, &c, (Signed) A N. Shaw.

Revenue Commissioner's Office, 9th July, 1849. Revenue Commissioner, Northern Division.
(True Copy) A MALET, Chief Secy.

No. 3389 of 1849.—Territorial Department, Revenue.

From E. H. TOWNSEND, Esquire, Revenue Commissioner S D.,
To A MALET, Esquire, Chief Secretary to Government, Bombay,
Dated 25th August, 1849.

Sir—I have the honor to acknowledge the receipt of your letters dated severally 5th ult., (No. 2909,) and 13th instant (No. 3176,) respecting the "practicability and expediency of procuring from the local revenue authorities notices of thunder, hail, and dust-storms, and of all unusual disturbances of the atmosphere."

Poona, 12th July.
Ahmednuggur, 17th July.
Sholapore, 23rd do.
Dharwar, 31st do.
Belgaum, 3rd August.
Rutnagherry, 10th do

The Collectors of this division to whom I referred the above question have replied on the dates quoted in the margin.

Mr REEVES suggests that the information sought by Government should be obtained from the Civil or Staff Surgeon at each station. In this opinion Mr. C M. HARRISON, Acting Collector of Sholapoor, coincides, remarking that "the Civil Surgeon, from the nature of his avocations, and the means and instruments at his disposal, is the officer best qualified to record the information desired by Government." In the above opinion, Mr COLES, Collector of Rutnagherry, concurs

The Collector of Ahmednuggur suggests that the information required by Government should be obtained from the most scientific officer at each station, and he names Captain GAISFORD as the person best fitted for this duty at Ahmednuggur. Mr BELL Collector of Dharwar, thinks that the duty in question may be required from the Civil Surgeon, or any other individual who may be better qualified to make and record the necessary observations; and in this opinion Mr INVERARITY, Acting Collector of Belgaum, concurs.

Medical men are perhaps more fitted by their education than any other class of the Honorable Company's servants for making Meteorological observations and reports : they have also much more leisure than those revenue officers who attend to their duty, and are generally stationary, which revenue officers are not, for the greater part of the year It would, I therefore think, be advisable, as a general rule, to require the Civil or Staff Surgeon at each station to supply the Collector, at the end of each month or fortnight, for transmission to Government, with a report, such as accompanied your letter of 5th July ; and should this suggestion be approved by his Lordship in Council, I would respectfully suggest that copies of that report and its tabular statements, should be forwarded direct from Government to each Collector, for the information and guidance of the Civil or Staff Surgeon at his station, on whom the above duty may devolve. I have the honor to be &c. (Sd.) E. H. TOWNSEND, Revenue Commissioner, Southern Division.

Poona, Revenue Commissioner's Office, 25th Aug., 1849. (True Copy) A MALET, Chief Secy.

THE Geographical Society held its ordinary Monthly Meeting in its rooms in the Town Hall, on Thursday the 18th October.—Present—Lieutenant-Col. ST. JOHN, in the Chair; Commander G JENKINS, I. N.; VENAEKRAO JUGONATHJEE, Esq.; MANOCKJEE CURSETJEE, Esq.; J. WATERSTON, Esq., I N.; DUNJEEBHOY FRAMJEE, Esq.; ALI MAHOMED KHAN, Esq.; J. JENKINS, Esq.; and Dr. BUIST.

[Council was at this time sitting, so as to detain the President and others of the members from the meeting.]

The first business which came before the meeting was a reference from the Committee on Papers on the following subjects : the Committee agreed *nem. con.* on the various subjects under review, but doubted their authority to expend money without special sanction. 1st, In reference to the arrangements in the lobby, it was recommended that sixteen of the best of the drawings of the Indus should be framed in blackwood, with stretching frames, canvas backs, and glass : this it was expected would be accomplished for less than Rs 30. Sanctioned.—2nd, It was recommended that the lesser maps and charts should be hung round the lobby, in terms of the permission of Government, and that the larger ones should be suspended from rollers so as to be capable of being lowered down or removed for reference if necessary : this it was supposed would cost Rs. 50. Sanctioned.—3rd, It was stated that the Museum was now encreasing so rapidly that it would be highly expedient to make proper provision for the exhibition of the specimens : this might for the present be very easily arranged by shelving the recesses in the windows of the lobby and protecting them by wire gauze screens. No precise estimate of the expence of this could be given—it was supposed that Rs. 25 might defray the charge of shelving ; leave must be obtained for this from Government. Sanctioned.

The Committee recommended that the Maps mentioned by Government as available, should be thankfully accepted of, and that Government should furthermore be applied to for such duplicates of charts or maps as might be in possession of the Indian Navy,—the Chief Engineer,—the Quartermaster-General,—or the Collector of Land Revenue,—when no copies required to be made or expense to be incurred ; the Society engaging to keep these with the utmost care, and to return them uninjured if required. It was assumed that in no way could they be of greater advantage to the public than by being exhibited in the ante-room of the Society, and where every precaution would be taken to preserve them from injury.

The following is an extract from the letter of Lieutenant AYTOUN:—

"If the Island of Johanna in the Mozambique would be a good point for making Meteorological Observations, there are now facilities for doing so which formerly did not exist. Mr Napier, the English Consul to the Comoro islands, and two Englishmen, are now resident there. From what I saw of those gentlemen last April, during my short stay at Johanna, I feel quite sure they would be delighted to become your coadjutors in the cause of Meteorology. They have a Barometer and Thermometer on the island, and were they to obtain directions for registering these at the most desirable times, I have no doubt they would be happy to undertake to do so. There is no Pluviometer on the island—Mr Napier told me he intended to get one from England; but were one sent to him now by a ship sailing from Bombay, and calling at Johanna, it would reach him much sooner than the one from England: and you would have by next hot weather a register of the fall of rain during their rainy monsoon, which commences about the 1st November. Another way of sending it would be through Captain Hamerton at Zanzibar, as there is intercourse by native boats between Zanzibar and Johanna. A great deal of rain must fall at Johanna: Mr Napier told me from December till April they had uninterrupted rainy weather. The land is very high—by observations at sea we made it out to be between three and four thousand feet above the level of the sea: this allowed for a much higher refraction than what is commonly taken for that latitude. Were it not for the influence of the monsoon in so bountifully supplying Johanna with water, it would be another Aden. It is a purely volcanic product, like Aden: and is composed of basalt, greenstone of all kinds, and immense deposits of cinders. Nothing, however, could be more dissimilar than the external appearance of these places. Johanna is covered from its peak to the water-edge with the most luxurious vegetation I ever saw—the upper part with thick forests of timber, the lower with grass and shrubs. The highest point of Johanna is called the 'Peak.' It is a cone, with a shoulder sloping down to the sea: on the top there is a lake, which doubtless now occupies the site of the crater."

The island of Johanna is in Lat. 13° S., Long. 45° E.

The following is an extract from the letter of Mr MAYES:—

SIR,—I have the honor to transmit by this mail the Meteorological Observations of Shum-Shum and Seerah Island; those of Seerah only extend to the 25th of the month. Owing to my being taken ill of a fever, and Dr. Barrington ordering me to go to Aden, as he could not attend me on Seerah, I had to remain in Aden from the 25th August to the evening of the 1st September, when I returned to Seerah, but owing to the weak state I was in, I was not able to go to Steamer-point to see after the Tide-Gauge until the evening of the 8th, from which time it is going, as during the last month, the Engineers have put it in a thorough state of repair, whilst during the time they were at work at it the tidal observations were stopped, and for a short time before they commenced the repairs it worked very badly, the clock stopping almost immediately after being set going, through the ricketty state of the frame, and the heavy surf, so that there is not more than fourteen days' observations from the 19th of July up to the 19th of August. The Tide-Gauge in Front-Bay is now in full work likewise, and is going on very well. This has been out of work for months, the Engineers taking it over on the 1st of May, and not finishing it until the 8th of September.

I think, according to Sir J. Herschell's "Treatise on Meteorology," in the Admiralty "Scientific Manual," I should not be without an Actinometer, and likewise a pair of Self-registering Thermometers, proper for taking radiation—one a black bulb for solar radiation, and the other for terrestrial radiation. Sir John differs in the mode of fixing the Thermometer for solar radiation: he objects to its being in contact with anything that may be heated by the sun's-rays, and says it should be suspended in free air; while mine, according to the observatory method, is fixed in a box, fastened to a bar, so as to allow it to be set full to the sun's rays, but screened from all currents of air:—which method is the most proper? In using a common thermometer, it is twenty chances to one if you get the maximum of solar radiation, even if it was looked at every quarter of an hour, while if a self-registering one is used it is sure. Above all, I think I should not be without a Standard Thermometer to keep the remainder always corrected by; and I think, if I were provided with one of Mason's Hygrometers, it would be an improvement, as with a common thermometer on a metal scale, such as we have to use here, where the muslin has to be wrapped round the bottom of the metal as well as the bulb, it cannot be so accurate as where the bulb is free, and not in contact with anything. I have one that I use, it being a Min. Thermometer, of which I have cut part of the wooden scale away, so that its bulb is always free, but I always have to keep a common Mercurial Thermometer, as a wet-bulb, in check of this; and if the Aden observations are to be kept on during 1850, which I am led to believe they are, I think these instruments would make a great improvement to my stock. I trust the observations would be greatly improve by my having the instruments, and I can assure you that no pains or time should be spared in using them to the best advantage.

I am afraid I shall very soon be deprived of my assistant on Shum-Shum, his regiment, the 2nd E. L. I., being about to be relieved, and as the regiment coming to relieve them is one of Her Majesty's, I shall not be able to get a man from it. Captain Haines has tried to get him transferred to the Town-Major's non-effective list, so that the might remain here, but the answer returned by the Town-Major was to the effect that he first must be placed on some establishment before he could do so. I would respectfully suggest your making application to Government for the services of Private Warcus, that he may continue in his present situation in Aden after his regiment is relieved: as he belongs to the Company's service, I think there is no doubt that it would be immediately complied with,—if not, I am not afraid we shall have to give up Shum-Shum altogether. I have the honor to be, sir, your most obedient humble servant,

W. MAYES, Sergeant, in charge of the Observatory.

Meteorological Observatory, Seerah Island, Aden, 18th Sept., 1849.

The *Secretary* stated in reference to these two, that he had prepared a memorandum for the consideration of the Committee, to the following effect: it had not as yet been laid before them, but its substance might now be stated—of course the arrangements contingent upon this would be determined on by the Committee, subject to the decision of the Society and approval of Government. The presentation of the memorandum was deferred until the arrival of the communication from H. M.'s Lords of the Admiralty, which, from the letter of Colonel SABINE, might, it was believed, be looked for by the first or following mail. It had long since been proposed that the Imaum of Muscat should be applied to, through the Resident, Captain HAMERTON, to establish a small observatory at Zanzibar: this might not only be the means of affording valuable aid to the Society in their present scheme of research, but would be of much value to travellers proposing to visit the interior of Africa. There seemed no reason to doubt but that a Prince of so much intelligence and liberality as the Imaum would at once undertake the project so soon as it was suggested to him. The dispatch of an Apothecary to Zanzibar offered a favorable opportunity for this: it was hoped that the party in question would be provided with instruments both for Zanzibar and Johanna, and trained in the use of them; and that through him returns should be received. Mr MAYES, in his zeal, proposed entering on a much more extended scheme of research than was deemed necessary: his past labours had in a great measure supplied all the information that was desired. By the close of 1849 they would have three years of observations at Aden as complete as well could be made, and only a little less perfect than those of a thoroughly endowed and organized establishment. This was in reality enough for the common purposes of meteorology. They had ascertained the Aden establishment both of tides and climate, and all that was hereafter wanted was the anomalies. There were two tide-gauges at Aden—one in front and one in backbay; and there were two self-registering rain and wind-gauges—one on Seerah, one on Shum-Shum: a continuance of the comparison betwixt these was not considered to be any longer requisite. It was, therefore, about to be proposed that one Tide-Gauge, and both the Wind-Gauges, should be taken down,—that a Wind and Tide-Gauge, a Barometer, and Thermometers, should be placed under charge of Captain LINGUIST at Suez, who had kindly intimated his willingness to assist the Society in its researches,—and that Mr MAYES should proceed thither, and remain as long as was deemed requisite for the establishment of the proposed observatory. He should then repair to some port in the Persian Gulf, and there establish a similar observatory —instruments meanwhile having been provided. The services of his present assistant must be immediately solicited from Government, and, should these be obtained, a Tide-Gauge and set of meteorological instruments would be maintained at Aden with the view of retaining a register of anomalies merely, the ordinary observations being greatly restricted. Supposing that arrangement completed, the labours of the following chain of observatories would be available for scientific purposes:—The Cape of Good Hope, Lat. 34°26′29″ N., Long. 18°23′15″ E.; Joahnna, Lat. 13°S., Long. 45° E.; Zanzibar, Lat. 6°3′15″ S., Long. 39°9′59″ E.; Aden, Lat. 12°56 N., Long. 45°10′ E.; Suez, Lat. 29°56′37″ N., Long. 32°25′50″ E; the Persian Gulf, say Bushire, Lat. 28°59′30″ N., Long. 50°30′ E; Kurrachee, Lat. 24° 52′

N.; Long. 67°17′ E.; Porebunder, Lat. 21°39′ N., Long. 69°45′ E.; Bombay, Lat. 18°56′ N., Long. 72°57′ E.; Vingorla, for Tidal Observations, Lat. 15°48′ N., Long. 73°43′ E.; Sawunt Warree, and Phoonda Ghaut, for Meteorology. Trevandrum, Lat. 8°30′ N., Long. 76°59′ E., which was only two miles from the Coast, and 95 feet above the level of the sea, the records of which had, through the kindness of Mr CALDECOTT and General CULLEN, been made as much available as if they had been under the Society. Ceylon, Lat. 5°47′ N., Long. 81°52′ E., where a Meteorological Observatory had just been established. Through the kindness of Captain WORSTER and Captain JACOB, the Madras Observations had been placed at their disposal; as had those at Calcutta through the goodness of Mr PIDDINGTON and Captain THUILLIER: while on the other side the Bay they had complete registers from Kyook Phyoo in Arracan. In the interior, again, they had admirable returns from Lucknow, Futtygurh, Peshawur, Ferozepoor, and there was no doubt they would speedily have them from Simla and many parts in the Punjaub;—while there were numberless contributors to their researches all over the Peninsula. The admirable measures just adopted by the Bombay Government, which promised such unbounded fruits, would, there was little doubt, be followed throughout India at large. These things were at present thrown out for consideration; they would shortly appear before them in a more exact and definite form than at present, and the present remarks might lead the Society beforehand to meditate on what was about to be suggested,—much of which, however, still depended on the answer of the Admiralty, and the views taken of their proceedings by the British Association.

The following papers were laid on the table. The time of the Society not permitting them to be read, they were desired to be referred to the Committee on Papers:—

PAPERS.—On the Geology of the Bombay Presidency. By Dr. Collier. With Maps, Drawings, and a large assortment of specimens.

On the Akranee Pergunnah. By Lieut. Rigby.—Presented by Government.

Route from Scinde to Peshawur. By Lieut. Raverty, 3rd Bombay N. I.

By the author, through Captain S. B. Haines, I. N., Political Agent at Aden, Tidal and Meteorological Observations as taken at Shum-Shum and Seerah Island, Aden, for the month of August, 1849. By Serjeant W. Mayes; with a letter dated Aden, 18th Sept. 1849.

By the author—John Caldecott, Esquire, F. R. S.—Abstract of Meteorological Observations taken at Trevandrum, for the months of July and August, 1849.

By the author—John C. Pye, Esq.—Meteorological Register for Futteygurh, for the months of June, July, August, and September, 1849.

BOOKS.—Presented by Government. "Bombay Magnetical and Meteorological Observations for 1846."

Presented by Government—"An Essay on Female Infanticide." By Cooverjee Rustomjee Mody, late Assistant Teacher in the Elphinstone Institution, to which the prize offered by the Bombay Government for the second best essay against female infanticide among the Jadujas and other Rajpoot tribes of Guzerat was awarded.

By the Ceylon Branch of the Royal Asiatic Society—Their Journals for 1846, 1847, and 1848, three volumes.

LETTERS.—From Colonel Sabine, dated Woolwich, September 7th, 1849, in reference to the Admiralty Grant, with copy of a letter to their Lordships on the subject in 1848,—intimating that he should be happy to assist the Society in the matter by all the means in his power.

From the Secretary of the Madras Literary Society, dated 26th September 1849, intimating the willingness of that Society to exchange Transactions.

From the Secretary of the Ceylon Branch of the Asiatic Society, dated September 21st, 1849, acknowledging the receipt of the Society's letter of 4th August, and intimating that they will have much pleasure in continuing to exchange publications.

From Commander C. W. Montriou, I. N., in charge of the Observatory, dated Colaba Observatory, October 8th, 1849, presenting and accompanying a copy of "Bombay Magnetical and Meteorological Observatory Report for 1846."

From A. Malet, Esq., Chief Secretary to Government, dated 13th October 1849, requesting the Society's acceptance of a copy of a Prize Essay on Infanticide.

From W. E. Frere, Esquire, dated Dharwar, 1st October, 1849, communicating advice of Rs. 38 remitted to the Society in payment of a set of Transactions bought by him.

From E. Roberts, Esq., Surat, dated October 13th, 1849, wishing to know whether he can procure a Barometer and Thermometer from the Society.

From Lieut. J. Daun, dated Rutnagherry, 25th September 1849 stating his wish to have a Mountain Barometer, a couple of Maxima and Minima Registering Thermometers, a first rate delicate Thermometer.

From Dr J. Patch, resigning his seat as a member,—dated Sept. 15th, 1849.

From Dr Giraud, tendering his resignation,—dated Oct. 1st, 1849.

From Messrs Remington & Co., with account closed up to July 31st 1849. open to Oct 1st.

From Mr T. J. A. Scott, wishing to become a Member, dated Oct. 18th, 1849.

Mr E. ELLIOTT, C. S., was proposed by the Hon'ble J. P. WILLOUGHBY, seconded by Colonel St. JOHN, and elected unanimously.

Mr T. J. A. SCOTT was proposed by Dr BUIST, seconded by Mr WATERSTON, and elected unanimously.

THE Bombay Geographical Society held its ordinary meeting in the Town Hall on the 22nd Nov.—Present:—Colonel N. CAMPBELL, Quartermaster-General, the senior member present, in the Chair in absence of the President; Major J. HOLLAND; NORMAN OLIVER, Esquire; Commander G. JENKINS, I. N.; Dr B. A. BREMNER; MANOCKJEE CURSETJEE, Esquire; VENAYEKRAO JUGGONATHJEE, Esquire; DHUNJEEBHOY FRAMJEE, Esquire; J. STOCKHAM, Esquire, Purser, I. N.; and Dr GEORGE BUIST, Secretary.

The minutes of last meeting were read and approved of.

The following donations of papers and books, with business letters, &c., were laid before the meeting:—

PAPERS.—By Captain Jacob, 19th Bombay N. I., forwarded by Government,—on a remarkable Hailstorm at Shikarghur, sixteen miles North of Peshawur, on the 22d September.

By Captain Fenwick, forwarded by Government.—Journal of a passage down the Nerbudda, from Chikuldah to Broach, with notices of the most important obstructions to the navigation.

By John P. Malcolmson, Esq., Staff Surgeon.—Meteorological Register for Peshawur, during the months of September and October.

By Corporal R. Leech.—Meteorological Register for Kurrachee during the month of Sept.

By Dr J. I. Murray, Woosung.—Meteorological Observations taken at Woosung, on the 7th and 22d days of July, and 7th and 22d day of August.

BOOKS.—Presented by Government.—"The Journal of the Indian Archipelago and Eastern Asia," for July.

Presented by the Medical Board.—Nos. 7, 8, and 9, of the Transactions of the Medical and Physical Society, Bombay.

Presented by the Proprietors of the *Bombay Times*.—"The English and Native Calendar for 1850."

From Smith, Elder and Co.—3 Copies of Riddell's Instructions, with sundry tracts.

LETTERS.—From Lieutenant Colonel Melvill, Secretary to Government, Military Department, dated 7th November 1849, acknowledging receipt of Society's letter of 25th October, and stating that the services of Private Alfred Warcus, at Aden, cannot be granted to the Society.

From A. Malet, Esq., Chief Secretary to Government, dated 1st November 1849, granting request contained in Society's letter of 25th October, viz., permission to fit up the recesses of the Lobby windows with shelves for specimens.

From A. Malet, Esq, Chief Secretary to Government, dated 10th November 1849, presenting to the Society "Copy of a letter from Captain Jacob, giving an account of a late Hailstorm at Shikarghur."

From C. J. Erskine, Esq, Deputy Secretary to Government General Department, dated 30th October 1849 requesting the Society's acceptance of a copy of a "Journal of a passage down the Nerbuddah, from Chikuldah to Baroach."

From C. J. Erskine, Esq, Deputy Secretary to Government, General Department, dated 24th October 1849, requesting the Society's acceptance of the 7th No. for 1849 of the "Journal of the Indian Archipelago and Eastern Asia."

From J. Scott, Esq., Secretary Medical Board, dated 24th October 1849, presenting to the Society Nos. 7, 8, and 9, of the "Transactions of the Medical and Physical Society, Bombay."

From Mr Mayes, Aden, dated 20th October, asking for more lithographed tide papers, as his were now nearly done.

From Smith, Elder, and Co., London, dated 6th October, 1849, informing the Society of the transmission of books, and of the state of affairs with regard to the Admiralty Grant.

From Dr John Ivor Murray, Woosung, dated 14th September, enclosing Meteorological tables for July and August.

From John Barlow, M. A., Secy. Royal Institution, returning thanks for the Society's present of their Transactions, and requesting to be furnished with other numbers.

From Corporal R. Leach, dated 15th October 1849, transmitting Meteorological Observations, and informing the Society of having broken one of his Thermometers, and requesting another one to be sent him.

From G. C. Caldwell, Esq., Secretary Ceylon Branch of Royal Asiatic Society, stating that he will communicate to the Society the results of some observations they are now making.

From Captain Ashburner, Porebunder, dated 20th October, informing the Society that he is about to be removed from Porebunder.

From Professor Baden Powell, dated Oxford, September 10th, 1849, returning thanks for the set of observations forwarded to him.

From Colonel Sabine, dated Woolwich, 7th September 1849, enclosing Copy of a letter addressed by him to Rear Admiral Sir F Beaufort, concerning the Tidal and Meteorological Observations being carried on under the Society's superintendence, and himself writing the Society on the subject of the Admiralty Grant

From Sir Charles Malcolm, dated 23d September 1849, on the subject of Meteorology and Geographical Research.

From N. A. Dalzell, Esq., Vingorla, dated 23d October, acknowledging the safe receipt of the rain-gauge sent him.

From Colonel Sykes, dated India House, 18th August 1849, on the subject of Physical Research; and another, dated Birmingham, 18th September 1849, concerning a system of co-operation, by inviting Meteorologists to communicate to some central point any unusual conditions of the atmosphere.

In reference to the Scheme of Observation for 1850, it was explained that the despatches expected to have been received from H. M.'s Lords of the Admiralty had not yet reached, but that it was understood from good authority that there would be some modification of the original Grant. No expense or responsibility of any sort had been incurred in anticipation of the grant. Government, when the scheme was first proposed to them, had undertaken for the entire charges of the maintenance of four observatories—those at Aden, Kurrachee, Mandavie or Porebunder, and Vingorla, or some corresponding stations,—and as yet no charges had been incurred in respect of any others: there could be no doubt whatever that Government would cordially adhere to its arrangements in reference to these, and, as originally agreed, meet the outlay required to be incurred—the much more especally as instruments had been found available in the stores, and had been applied for with the view to their being returned when required, without charge to any one unless they should suffer in the cause. It was now suggested that this view of matters should be strictly adhered to, and that the grant of the Admiralty, whatever it might be, should be made the most of for extended observation. At Aden they had obtained a large and valuable mass of observations, extending over three years complete, and this seemed quite sufficient to determine the type of the climate: the anomalies were all that would hereafter be required.

The following proposition was unanimously agreed to, and the Secretary was directed to submit it to Government for their consideration:—

"ADEN.—That one Tide-Gauge, and both the Wind-Gauges, should be taken down,—that a wind and Tide-Gauge, a Barometer, and Thermometers, should be placed under charge of Captain Linguist at Suez, who had kindly intimated his willingness to assist the Society in its researches,—and that Mr MAYES should proceed thither and remain as long as was deemed requisite for the establishment of the proposed observatory. He should then repair to some port in the Persian Gulf, and there establish a similar observatory—instruments meanwhile having been provided. A Tide-Gauge and set of meteorological instruments would be maintained at Aden with the view of retaining a register of anomalies merely, the ordinary observations being greatly restricted."

In defect of an organised establishment, the observations of the Medical Officer at Aden, if made in conformity with the plan proposed by Government for the Civil Surgeons at the presidency, would be perfectly sufficient: were he furnished with a good barometer and thermometers, to be employed in the manner desired by the Society, everything that could be wished for would be obtained through him.

In reference to the letter of Major JACOB, Sawunt Warree, stating that he would require a house to be built for the reception of the Wind and Rain Gauge that had been sent to him, it was remarked that the instruments in question had been sent out by the Court of Directors to the Madras Government for use at Cochin. They had been forwarded to Bombay in February 1845, and had ever since remained unemployed. They were very perfect, but cumbersome: they had been sent to Major JACOB because of his well-known and indefatigable zeal in such researches; because it was supposed they might be the means of instructing the pupils of the Seminary under him in the general method of automaton observation; and because the principal teacher under Major JACOB had formerly been for four years an assistant at the Colaba Observatory, where an instrument precisely similar was in use: and on these grounds it was believed it would be considered desirable, and would not be found difficult to use. It was never meant that the cost of a building for its use should be incurred at such a place as Sawunt Warree, or that any particular effort should be made for its sake. Should Major JACOB find it troublesome or expensive to get in use, it was proposed to have it sent to Mr DALZELL, Vingorla, who had most kindly undertaken to assist the Society. Should he find it troublesome, it might be returned to the presidency. This proposition was unaminously assented to.

DR BUIST stated in reference to the letter of Captain JACOB, that there were few things of greater interest amongst the anomalous phenomena of Meteorology than the occurrence of Hail-storms in hot countries. He had drawn up a list of these, chiefly from the extracts in the *Asiatic Journal*, and more lately from the newspapers.—See Transactions.

Dr BUIST continued:—The following conclusions seem deducible from these facts, subject, of course, to modification as our information extends:—

1st That hailstones in India are generally from five to ten or twenty times the size of those at home, from six ounces to a pound being nothing unusual with us here.—Hail in England hardly ever exceeds the size of beans or filberts: that in India is often the size of oranges or pumpkins,—hardly ever less than walnuts.

2nd. Hail generally falls betwixt noon and sunset—hardly ever after it is fairly dark: it is almost invariably accompanied by violent storms of wind and rain, and generally of thunder and lightning.

3rd.—No hailstorms of any magnitude are known to have occurred at the level of the sea south of the 22nd parallel: they are most abundant immediately to the north of this, and are plentiful to the South on ascending 1000 feet above the level of the sea. The fall of hail at Bombay in 1832 seems to have been slight and insignificant, and scarcely forms any exception to this.

4th.—The Delta of the Ganges, especially the low country within 50 miles of the Bay of Bengal, seems especially liable to hailstorms.

5th.—Though hailstorms generally occur in the dry season, south of the Tropic, and are seldom experienced earlier than the month of January, a dry atmosphere seems by no means essential to their appearance : a violent hail storm occurred at Belgaum on the 3rd June, when the air was charged with moisture, and the rains close at hand. Hail fell at Indore on the 6th and 7th June; and in the end of July, hail fell on the Mahabuleshwar Hills, when the air was at the point of saturation. There seems to be no record of the occurrence of Hail in Ceylon or indeed to the southward of Ootacamund, lat. 12°.

Dr BUIST said if the Society would bear with him he would still trouble them with another catalogue of Meteorological phenomenon of somewhat rare occurrence —he meant Luminous Meteors. He had received by a former mail the acknowledgments of Professor BADEN POWELL for some information communicated on this subject, and laid before the British Association at Birmingham, and which would appear in their Transactions. He had formerly laid a note on the same subject, received last year from Professor BADEN POWELL, on the table of the Society, with a copy of his catalogue of Meteors; and it occurred to him (Dr BUIST,) that the best way of efficiently assisting Professor POWELL would be to endeavour to draw up and publish a list of Meteors that had been seen or had fallen in India, in hopes of, by this means, drawing out information on the subject, so as to collect something like a contribution worthy of transmission to the general treasury at home. The present catalogue, like that of the hailstorms, was chiefly compiled from the *Asiatic Journal*, the Bengal and Madras Transactions, and the newspapers, and was in the last degree incomplete and imperfect. The great thing was to make a beginning—the very worthlessness of the commencement might stimulate others to attempt a more perfect work. There must needs be a vast quantity of information in the possession of individuals, capable of being produced when known to be desired, but which had never hitherto been laid before the world; and there were doubtless hundreds of instances for every one that had been quoted scattered about in our newspapers, and which it required but a little concert and co-operation to fish out.

The earliest records we possess on these subjects are the first published volumes of the *Asiatic Researches*, which carry us about seventy years back: one of the most valuable, because one of the most accessible, repositories of information is the now defunct *Asiatic Journal*. The newspapers in India are the grand emporia of current gossip, and ephemeral information on scientific matters—and those connected with them professionally, who had occasion to receive and to consult them all, had in this respect an advantage over most other men in reference to the journals of the day. Unfortunately the newspapers in India had no Index, and to bring up the knowledge of the past from old files, or to consult the volumes for years gone by, required an expenditure of time few could command, and involved an amount of labour scarcely any were prepared for.—See Transactions.

The lists given in the various observatory reports were not read—and it was intended, should the Society so permit, to extend both papers previous to publication, provided further information could be procured. The Society had three fine specimens of meteors in its possession: the beautiful mass of meteoric iron from Singhur, presented by the Reverend Mr REYNOLDS, and analysed by Dr GIRAUD; the Meteoric stone seen to fall in Candeish in February 1848, so copiously described by Captain WINGATE; and the Goozerat Meteor of 1847, presented by Captain FULLJAMES,—both, like the iron, having been analysed by Dr GIRAUD.

Moved by Major HOLLAND, seconded by Colonel CAMPBELL, and agreed to —that Dr BUIST receive the thanks of the Society for his catalogues, and that he be permitted to extend them as desired previous to publication.

Major HOLLAND said.—During a violent storm of rain, in June or July 1832, about 2 P.M., a ball of fire was by many persons seen to descend on the roof of Sir Colin Halkett's house "Non Parell" (near Parell,) exploding with a loud report. It appeared to strike the northern extremity of the main beam of the roof, which was shattered into splinters: the electric fluid then passed through the walls into the rooms of the northern wing of the building, some of the window frames, which had been protected by iron bars, being forced out of the masonry. The lightning then appeared to run through and along the walls of the bedrooms and drawing-room: the latter were painted in pannels, yellow with white borders, the white borders appearing the chief attraction, the yellow being untouched, or vice versa. Some mirrors and pictures hanging against the wall were broken and scorched, the gilt frames remaining untouched. Some of the lower rooms of the north wing contained several presses full of glass-ware, and some plate chests: the former were more or less broken—one of them as if a shell had burst inside, leaving scarcely a fragment the size of one's hand: others were less broken, but while all, or nearly all, the white glasses in these latter were broken, the green hock and finger glasses were nearly uninjured. The plate chests had their locks and iron bands wrenched open, and the silver articles more or less tarnished—in one of the chests the upper tier of spoons was scratched or notched as if by a file. Several persons of the establishment present in the north wing at the time were injured, and one or two were found insensible, but no one was seriously injured. In one of the glass windows in the back veranda (stained green,) there was a clear round hole, as if cut by a pound ball. The family were fortunately at the time in the southern wing of the house, and Major Bonamy, who had a penknife in his hand, felt a smart shock. I was not in the house at the time, but arrived there an hour or two after the occurrence, and witnessed the results, an account of which I have given from memory.

Dr BUIST read a paper of some length on the evaporation of, and probable currents in, the Red Sea, in continuation of his former remarks.

Commander JENKINS gave notice of the following motion for next meeting:—"That, in testimony of the respect felt by the Society for Dr BURNES, late Physician-General, and formerly Vice-President of the Society, and the

contributions which had been made by him and his brother to the science of Geography, the Society elect him Honorary Vice-President."

Dr JOSEPH was proposed by MANOCKJEE CURSETJEE, Esq., seconded by Dr BUIST, and unanimously elected Member of the Society.

Mr JOHN MACFARLANE was proposed by Major HOLLAND to be elected Assistant Secretary: the motion was seconded by Colonel N. CAMPBELL, and agreed to unaminously.

ON the 20th December the Bombay Geographical Society held its Ordinary Monthly Meeting in the Town Hall. Present: President—Hon'ble J. P. Willoughby. Members: Dr White; J. Ritchie, Esq.; Ali Mahomed Khan, Esq.; Captain Jenkins, I. N.; J. Stockham, Esq., I. N.; Commodore Lushington; Dr M. Joseph; Professor J. Patton; S. S. Dickinson, Esq.; and Dr George Buist, Secretary.

The minutes of the last meeting were read and approved of. The following letters were then read:—

From Captain Becher, R. N:—

"ADMIRALTY, 19*th October*, 1849.

"SIR,—The Hydrographer, Sir Francis Beaufort, being absent, it becomes my duty to inform you that their Lordships, having referred your application for assistance towards carrying on tidal and other observations on the shores of Western India and Arabia to the Astronomer Royal, have decided on placing the sum of one hundred pounds at the disposal of the Hon'ble the Court of Directors for that purpose.—I am, Sir, your most humble servant,

"A. B. BECHER, Commander R. N."

"Dr Buist, Secretary Geographical Society,—Bombay."

From A. Malet, Esquire, Chief Secretary to Govt.

No. 5205 of 1849.

To G. Buist, Esquire, L. L. D., Secretary to the Bombay Geographical Society.

Political Department, Dated the 30th November 1849.

SIR,—I am directed by the Right Hon'ble the Governor-in-Council to acknowledge the receipt of your letter dated the 13th ultimo, No. 78, on the subject of obtaining, periodically, Meteorological Observations and returns from the several stations under this Presidency.

2. In reply, I am desired to convey the acknowledgments of Government for the valuable suggestions contained in the 13th para. of your letter, a copy of which has been forwarded to the Revenue Commissioners of the Northern and Southern Divisions, and to the Political authorities under this Presidency, that measures may be adopted for giving effect to the same from the 1st January next. Copy of my letter of this date to those Officers is enclosed for your information.

3. The Right Hon'ble the Governor-in-Council requests that you will be pleased to forward to Government one hundred sets of the forms accompanying your letter, and (when printed) thirty copies of the manual of instructions alluded to in the 4th para. thereof. The cost of these articles will be defrayed by Government, on a contingent bill for the same being preferred.

I have honor to be, Sir, your most obedt. servt. A. MALET,
Bombay Castle, 30th November, 1849. Chief Secretary.

Copy of a letter from A. Malet, Esquire, Chief Secretary to Government, to the Revenue Commissioners of the Northern and Southern Divisions.

No. 5189 of 1849.

From A. Malet, Esquire, Chief Secretary to the Government of Bombay,

To E. H. Townsend, Esquire, Revenue Commissioner Southern Division.

Political Department, Dated the 30th November 1849.

SIR,—With reference to your letter dated the 25*th August last*, *No.* 3380, (18*th ultimo No.*2132,) on the subject of obtaining periodically Meteorological Observations and returns from the several stations under this Presidency, I am directed by the Right Hon'ble the Governor-in-Council to transmit to you copy of a communication from Dr Buist, Secretary to the Geographical Society, dated the 13th ultimo, No 78, and to request that you will adopt measures for giving effect, in the several Collectorates under your control, to the suggestions therein contained.

2. I am at the same time desired to transmit to you, for the purpose of being supplied to the civil surgeons to whom the duty of keeping the Register is to be entrusted, sets of the forms alluded to in the 3rd para of Dr Buist's letter. As it is probable that the information contem-

plated in these returns cannot in all cases be completed in full, His Lordship in Council leaves this to the discretion of the Officers entrusted with this duty, it being intimated to them that the more perfect the returns can be made, the more valuable they will be considered.

3. I am further desired to request that you will be pleased to ascertain whether the Meteorological instruments enumerated by Dr Buist in the 6th and 7th para of his letter are at the command of the officers to whom the above duty is to be entrusted, otherwise they will be supplied to such extent as practicable.

4. As the present year is so near its close, the proposed plan should be brought into operation from the 1st January next, the reports being submitted quartorly, through the Secretary to Government in the General Department.

I have &c. &c. (Signed) A. MALET,
Bombay Castle, 30th Nov. 1849. Chief Secretary.

No. 5190 of 1849.

To A. N. Shaw, Esquire, Revenue Commissioner Northern Division.

SIR,—(The same as above, with the requisite alteration.)

(True Copies.) A. MALET, Chief Secretary.

Specimens of the schedules referred to in Mr Malet's letter were laid before the Society, and approved of. Captain Jenkins rose and read the following letter from Captain Becher in reference to the Ross Testimonial:—

SIR,—In the temporary absence of the Hydrographer, Sir Francis Beaufort, it becomes my duty to acknowledge the receipt of your letter to him of the 4th of August, on the subject of the Ross Testimonial.

My first care in doing so must be to assure you how fully he participates in the feeling which has given rise to the intentions expressed in your letter, and how gladly on the part of the Admiralty he will assist the Committee with the resources of his office in establishing a testimonial so useful as that which you propose, and which must tend to promote the Commercial and Naval interests of India.

Referring then specially to the charts constructed from the numerous costly surveys which have been made by command of the Lords Commissioners of the Admiralty, since the establishment of this office, a selection of which I am directed by the Hydrographer to inform you will be presented by him to the Ross Testimonial, I herewith enclose for your information an estimate from a well qualified person, of the expense of placing these charts on rollers, and fixing them in boxes against a wall for their preservation. But I may also add that, in the opinion of Admiral Sir Charles Malcolm, as well as of Sir Francis Beaufort, the purposes of reference will be better answered, and a proper economy secured, if the method adopted in the library of the Royal Geographical Society were followed by you; being simply that of flexible thin covers, including small portions separated according to the Navigation, and kept in close drawers numbered for reference. They may thus be placed on a table for use when required, and returned when done with.

Such details, however, are left to your Committee to decide on, and if you will have the goodness to communicate their wishes to Sir Francis Beaufort as to the adoption of either of these plans, or whether having the charts single would be pr ferred, I will take on myself to assure you that those wishes shall receive immediate attention.

I leave it to the Hydrographer to reply hereafter to the other points alluded to by you, and assuring you of the satisfaction which I derive from making this communication,

I remain, Sir, your very humble servant, (Signed) A. B. BECHER,
Admiralty, 19th October 1849. Commander Royal Navy.

And regarding the manner and expense of fitting up the anticipated charts, the following:

SIR,—I beg to inform you that the price of Mounting Plans of Charts will be 7s. 6d. per foot on back boards and spring rollers, and in mahogany boxes, and spring rollers, 10s. per foot: of course the length of the box or backboard is what we shall charge.—I must chance what the depth of the maps will be. The mounting of the chart and blank paper at top is included in the above charge.

Oct. 13th, 1849. Yours obediently, (Signed) THOMAS MALBY.

Captain Jenkins now made the following motion, which was seconded by the Secretary, and carried unanimously:—

"That the Society express its regret for the departure of Dr Burnes from amongst us, and, in testimony of their appreciation of his services to the cause of Geographical Science, elect him an Honorary Vice-President."

The following Papers, Books, and Letters, were laid on the table.

PAPERS.—Meteorological observations for the Month of October, taken at Kurrachee.—By Corporal R. Leach.

Abstract of Meteorological Observations taken at the Trevandrum Observatory, for the months of September and October.

Meteorological Register kept at Calcutta—for the Month of October. By Captain H.L. Thuillier, Deputy Surveyor General.

Abstract of Meteorological Observations made at the Magnetic Observatory, Colaba, during the Months of May, June, July, August, September, and October, with hourly observations on the most remarkable days in the Months of January, February, March, April, and May.

Meteorological and Tidal Observations taken at Aden, during the Month of October. By Mr Mayes. From Captain S. B. Haines, I. N.

Meteorological Register for the Month of October, kept at Futteghur. By John C. Pye, Esq.

Books.—Presented by Government.—Documents regarding the Navigation of the Ganges from Allahabad to Rawulgunge.

Presented by Government.—The Journal of the Indian Archipelago and Eastern Asia, for the months of August and September.

Presented by James Madden, Esquire, 8 Leadenhall Street, London.—"Decline of Geographical Discovery." By James Richardson.

The Revelations of an Ordorly. By Panchkouree Khan.

Arabic Grammar and Dialogues. By Captain Fletcher Hayes, M. A.

Presented by Dr Buist.—"Dry leaves from Young Egypt." By an ex-Political.

Presented by the Author.—J. W. Laidlay, Esquire, V. P., and Secretary A. S. Calcutta.—"The Pilgrimage of a Fa Hian."

From the Asiatic Society of Calcutta.—Of their Transactions. Old series, Vols. 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20,—New series, Vols. 8, 9, 10, 11, 12, 13, 14, 15, 16, 17.

Received by the Ship "Owen Glendower."—Six copies of Part I., Vol. 19th, of the Journal of the Royal Geographical Society of London.

By Ship "Owen Glendower."—One copy of "Bulletin de la Societé de Geographie," third series, Vol. 10.

Presented by the College.—"Annual report of the Grant Medical College for the year 1849-50."

Letters.—From Messrs Adie, 50 Prince's St., Edinburgh, dated 17th October 1849, regarding the instruments ordered by the Society, of which he encloses an invoice.

From Colonel Sykes, dated from India House, 19th October 1849, regarding a uniform system of observation, and uniform plan of record, which he earnestly presses should be adopted throughout the world, and concerning the different mean temperatures of various places in different latitudes.

From Commander C. W. Montriou, dated 8th December 1849, enclosing Meteorological Observations mentioned in the list of papers.

From J. G. Lumsden, Esquire, Secretary to Government, dated 4th December 1849, requesting the Society's acceptance of a compilation of Documents regarding the Navigation of the Ganges from Allahabad to Rawulgunge.

From J. G. Lumsden, Esquire, Secretary to Government, dated 10th December 1849, requesting the Society's acceptance of Nos. 8 and 9 of 1849 of the Journal of the Indian Archipelago and Eastern Asia.

From Corporal R. Leach, dated Kurrachee, 22nd November, accompanying the Meteorological Register kept by him.

From Dr C. Morehead, presenting from the Grant College a Copy of the Annual Report of the Grant Medical College for the Session 1848-49.

In reference to the acknowledgments, by Colonel Sykes, of some schedules of Meteorological Observations, the Secretary stated that, as the promptitude of the supply of information was of the very greatest importance to enable gentlemen to pursue their researches, he had taken the liberty of forwarding Colonel Sykes sheets of the Meteorological Observations belonging to the Society from Kurrachee, Lucknow, and Aden, now passing through the press, with MS. copies of others not yet in the printer's hands. These would be all fully and faithfully acknowledged; and as the object of Colonel Sykes was the same as that of the Society, viz., the discovery and dissemination of truth, he had no hesitation whatever in thus assisting him, though there was no time to obtain the Society's permission to do so. He had in like manner given sheets or extracts from the Observatory Reports for 1842, '43, '44, and '45. It was in strict conformity to general usage to give out sheets of philosophical works passing through the press before the works themselves were published; and he (the Secretary) had received

some three or four papers from the Transactions of the British Association for 1848 long before the volume itself was ready for publication. The practice was of the greatest advantage, to men of science especially, in the case of works which take long to pass through the press: it occasioned scarcely any trouble to any one, and not one moment of delay, and greatly promoted the advance of truth,—the object they all had in view. He had, therefore, to request a vote of indemnity for what he had already done, with leave to continue the practice where men of known learning asked to be indulged, and assigned some specific reasons for claiming the indulgence.—Indemnity and leave granted.

The SECRETARY stated that as he had once before brought before the Society a subject in the investigation of which he had long been deeply engaged,—that of Atmospheric commotions, of simultaneous or nearly simultaneous occurrence, in the probable existence of which there seemed many strong reasons for believing, he would read the following extract from Colonel SYKES' letter:—

"A new light is bursting in upon us, connecting the movements of the Atmospere with Electric tension. Five years' electric observations at Kew have been discussed, and it has been found that there are two daily minima of intensity, an annual maximum and an annual minimum: and all these phenomena occurring at the same hours daily, and in some months annually, as the movements of the Barometer within the tropics!"

These remarks referred to the recognised regular and systematic movements. The following list of Auroral Exhibitions, given in the *Edinburgh Philosophic Journal*, corresponded wonderfully with the more regular atmospheric disturbances already referred to:—

Aurora in the North of Europe.	Atmospheric Disturbances between the Tropics.
1848.—18 October.	19.—A second Elephanta at Bombay—Storm at Ceylon.
27 October.	27.—No Disturbances remarked.
17 Nov.	17.—The weather was excessively irregular on the 17th, 18th, and 19th November, and a remarkable atmospheric disturbance occurred at Bombay on the first named of these days.
21 Nov.	19, 20, and 21 Nov., heavy fall of rain with an excessively moist atmosphere. Rain and Thunder on the 21st and 22nd over Central India.
1849.—14 Jan.	14, 15, & 16 Jan., violent atmospheric disturbance all over India.
17 Feb.	17.—Dew and rain in Scinde—intense cold at Deesa.
(Here the list ends)	19th Feb.—No atmospheric disturbance observed as connected with this.

Here there were two cases out of seven where there was no atmospherical connection observed in India as coincident with Auroral exhibitions: there were betwixt October 18, 1848, and February 19, 1849, at least four remarkable atmospheric commotions with which no auroral exhibition had been observed to coincide: but in five of those desired to be adverted to, the coincidences were sufficiently remarkable to arrest attention:—they may yet, in reference to broken cases of non-coincidence, be completed. At last meeting, the fall of an immense mass of

ice in Khandeish, about 1826, had been adverted to by Mr. MALET and Major HOLLAND.

As these gentlemen spoke on hearsay only, and as rumour was given to exaggerate, it was important to have a case which showed that there was in this nothing at all events inconsistent with probability. Dr HYNE states in his Tracts on Indian affairs, published in 1814, that in the time of TIPPOO SULTAN, a mass of ice had fallen near Seringapatam as large as an elephant, and which it took two days to melt. Those who had handled it complained that it had burnt their fingers like hot iron. In the *Edinburgh Physical Journal* of October last it was stated that "in August, immediately after one of the loudest peals of thunder ever heard, a large mass of ice, nearly twenty feet in circumference, was discovered to have fallen near a farm house in Ross-shire. It had a beautiful crystalline appearance, being nearly all transparent, with the exception of a small portion which appeared composed of hailstones of enormous size cemented together."

Captain JENKINS stated, in reference to the letters from Captain BECHER, that he thought it would be expedient to apply to the Governments of Bengal, Madras, and Bombay, for copies of all the Maps in their possession, and to the Court of Directors for a grant of money. It was remarked in reply, that the testimonial could only be considered complimentary to Captain Ross in so far as it was voluntary—that the Bombay Government had just ordered an entire set of the Maps and Charts belonging to them, to the amount of some hundreds, to be presented to the Society; and that permission might be obtained, if deemed requisite, to have these made to constitute a portion of the Testimonial. All thatcould well be attempted with the other parties would be to call their attention to what had been done by H. M. Admiralty and the local government.

It was stated that the instruments ordered from Edinburgh by the Society were shipped in October, and might be expected in January. Mr ADIE had sent a printed pamphlet of instructions for their use. The barometers had all been bespoken, but a second order for more had been sent home.

The very cordial thanks of the Society were directed to be given to the Royal Asiatic Society for the magnificent donation of their researches and transactions.

After some other conversational discussion, the meeting adjourned to Thursday the 24th January 1850.

ON the 24th of January 1850, the Bombay Geographical Society held its ordinary monthly meeting in its Rooms, in the Town Hall.—Present: The Hon'ble J. P. Willoughby, in the chair; Colonel N. Campbell; T. J. A. Scott, Esq.; Norman Oliver, Esq.; Manockjee Cursetjee, Esq.; Dhunjeebhoy Framjee, Esq.; Ali Mahomed Khan, Esq.; S. S. Dickinson, Esq.; and Geo. Buist, Esq., Secretary.

The minutes of the last Meeting were read and approved of.

The Secretary then proposed that the following Bye-laws and rules should be adopted.

1. That the Members of the Bombay Geographical Society be in future elected by ballot.
2. That Honorary Members be admitted into the Society the same as Ordinary Members.
3. That books of reference such as the drawings of the Nimroud Sculptures, &c., may be given out of the Rooms to Members for 48 hours on the order of the Secretary to that effect.

The Society unanimously concurred in passing these rules, and directed them to be carried into effect henceforth.

The Secretary then asked whether a Member on his election was entitled to any portion of the Society's Transactions.

After some conversational discussion on the subject, it was agreed, that Members on their election should not be entitled to any of the previously published Transactions of the Society.

The following books, letters, and papers, were laid before the Meeting.

Books.—Presented by Government.—The 10th No. Vol. III. of the Journal of the Indian Archipelago and Eastern Asia.

Papers.—Presented by General Cullen.—Abstract of Meteorological Observations taken at Trevandrum Observatory, for the months of November and December.

Meteorological Register kept at Calcutta for the month of October, by Captain H. S. Thuillier, Deputy Surveyor-General.

Meteorological and Tidal Observations taken at Aden during the month of November. By Mr Mayes, from Captain S. B. Haines, I. N.

Meteorological Register for the months of November and December, kept at Futtegurh. By John C. Pye, Esq.

Letters.—From Thomas Ogilvy, Esq., Political Assistant in Kutch, dated 13th December, 1849. —Requesting information regarding the instruments to be used by the Civil Surgeons.

From Alexander Adie and Son, dated 13th November, 1849.—Enclosing a bill of lading for a box of the instruments, and informing the Society of the advanced state he is in with the remainder.

From J. G. Lumsden, Esq., Secretary to Government, General Department, dated 7th January, 1850.—Enclosing a list of Maps which can be spared from the Quarter-Master General's Office, and stating that Government will be happy to present the Society with any of them which the Society might wish to have.

From Mr Mayes, Aden, dated 15th December, 1849.—Enclosing a set of Meteorological and Tidal Observations for the month of November, and stating that there are no Shum Shum Observations for this month, as Mr Warens has been taken away with his regiment.

From W. E. Frere, Esq., Collector, Dharwar, dated 1st January, 1850.—Advising of his having remitted his subscription to the Society for the year 1849-50.

From Captain W. Phayre, 25th N. I., dated 2nd January, 1850.—Advising the Society of having sent his subscription to John Stuart, Esq., Bank of Bombay.

From J. G. Lumsden, Esq., dated 16th January, 1850.—Desiring the Society's acceptance of the 10th No. of Vol. III. of the Journal of the Indian Archipelago and Eastern Asia.

From Messrs Henry Barrow and Co., 26 Oxendon Street, London, dated 17th December, 1849. —Enclosing a bill for cleaning and repairing a dip circle, and supplying needles, &c.

In reference to a letter from Major LeGrand Jacob intimating that the Wind and Rain-Gauge sent him could not be set up at Sawunt Warree for want of a suitable building, and complaining that he had not beforehand been made aware that it was about to be sent,—the Secretary stated that the blame of omission was entirely his own, and he could only regret that he should unhappily have given so valuable a labourer in the course of research as Major Jacob grounds of complaint.

There was no meeting in February, owing to the sickness of the Secretary.

On the 21st of March 1850 the Bombay Geographical Society held its Ordinary Monthly Meeting in its Rooms in the Town Hall.—Present: Col. N. Campbell in the Chair; Norman Oliver, Esq.; James Stockham, Esq.; Dhunjeebhoy Framjee, Esq.—The minutes of last Meeting were read and approved of. The Assistant Secretary then read the following letters:—

BOMBAY, *2nd February*, 1850.

MY DEAR SIR,—I have been desired by the Governor-General to acknowledge the receipt of your letter of 31st January, and of the Copy of the Transactions of the Geographical Society, and to tell you that His Lordship is happy in accepting the compliment, which the Society has done him the honor of offering to him, and that he will be at all times glad to facilitate by every means in his power, their researches in India.—I am, dear sir, yours sincerely,

(Signed) J. RAMSAY, *Military Secretary.*

To GEORGE BUIST, Esq., *Secretary Bombay Geographical Society.*

POINT DE GALLE, *8th February*, 1850.

MY DEAR SIR,—The Governor-General desires me to address you, as he is in some apprehension lest in the hurry of departure from Bombay, a letter which he there wrote to you, should not have reached its destination.

The object of that letter, as it is of this, was to acknowledge the receipt of the communication from the Geographical Society of Bombay, which you forwarded to the Governor-General, and to state that His Lordship had great pleasure in accepting the honourable post in relation to that Society which it was proposed to confer upon him.

Lord Dalhousie further desires me to assure you and the Society, that he will be very ready at all times to afford such aid to the researches of the Geographical Society in India, as his influence may enable him to command.—I beg to remain, my dear sir, very faithfully yours,

(Signed) J. F. COURTENAY.

To GEORGE BUIST, Esq., *Secretary Bombay Geographical Society.*

To GEORGE BUIST, Esq., LL.D., *Secretary to the Geographical Society, Bombay.*

DEAR SIR,—I have the honor to transmit by this mail my Meteorological and Tidal Observations for the month of December 1849, with a few observations for absolute inclination as taken with the dip circle which I received from Captain Haines on the 20th of this month, as received by him from England last mail. It is in very good order; they have made new levelling screws for it, and the circle has been nicely cleaned and bronzed, and completed with four fine needles.

I likewise have to acknowledge the receipt of 100 Tidal Papers for Front Bay, they have been printed for a Tide-Guage that is fitted up with an Anemometer as well, but they just answer the Cylinder of my Front Bay Tide-Guage. I have sent a Copy one of the Back Bay Tide Papers for a fresh supply, as I am now quite out of Back Bay Papers. The thousand Anemometer Papers which Captain Haines got up from Government about two years since, could be brought in use by using a smaller board or thinner chain as I have tried them, as the small chain sinks deeper into the grooves of the wheel, and it not having so great a diameter does not throw the board forward quite so fast and just brings them under the penaile in 24 hours; but I thought it better to ask you whether I might use them or not, as it is a pity to let them be lost, as they cannot be made use of for any thing else.—I remain, your humble and obedient servant,

(Signed) W. MAYES, *in charge of Meteorological Observatory, Aden.*

To G. BUIST, Esq., LL.D., *Secretary Geographical Society, Bombay.*

SIR,—I have the honor to acknowledge the receipt of your letter upon the dip circle by Mr Caldecott. I am afraid I will not be able to take my observations while oscillating, as it requires two people to perform the task, one to read, one to register them, and then it would be a very difficult task with a circle so small as the one I have.

I have sent by the mail my observations for the month up to the 27th instant, which have been taken morning and evening of each day with the same needle. I also send a list of Meteors for the month of November 1849. There are but very few, it being a very cloudy morning: I must have mislaid them before I thought I had sent them in December.

I shall be very thankful if you move off the small sheets of paper ruled for my hourly observations as my others are all done.—I have the honor to be Sir, your most obedient servant,

(Signed) W. MAYES, *in charge of Meteorological Observatory, Aden.*

The following books, letters, and papers, were laid on the table:—

BOOKS.—Presented by Government.—No. II. Vol. III. of the Journal of Eastern Asia and the Indian Archipelago.

Presented by Sir H. Elliott.—A Copy of his Index to the Mahomedan Historians.

Presented by Dr Buist.—Copy of Colonel Reid's Book on Storms.

Presented by B. White, Esq.—History of Persia, 2 vols.; Journal of Lieut.-Col. FitzClarence, 1 vol.; Journal of Henry Ellis, 1 vol.

Presented by the Author.—Newbold's British Settlements in Malacca.

From Smith, Elder & Co.—Published by the Hakluyt Society.—Historie of Travaile into Virginia.

Presented by the Students' Literary and Scientific Society.—A Copy of the Students' Miscellany.

Papers.—From Mr Mayes, Aden, through Captain Haines.—Tidal and Meteorological Observations for the month of December, 1849.

From Captain H. L. Thuillier, Deputy Surveyor-General.—Meteorological Observations taken at Calcutta for the month of December, 1849.

From W. P. Gillanders, Esq., Civil Surgeon, Ahmedabad.—Meteorological Observations for the month of January, 1850.

From J. Murray, Esq.—Meteorological Register kept at Woosung Dispensary, from December 1847 to July 1849.

From R. N. C. Hamilton, Esq., Resident at Indore.—Note on the Transport of Coal from the pits at Sonadeh to Bombay, by the Nerbudda River.

From Commander Montriou, I. N.—Abstract of Meteorological Observations for the months of November and December.

From Commander Montriou, I. N.—Tidal Observations for the year 1849. (Printed.)

From W. P. Gillanders, Esq., Civil Surgeon, Ahmedabad.—Meteorological Observations for the month of February.

From Mr Mayes, Aden.—Magnetic and Meteoric Observations for February.

From Captain H. L. Thuillier, Deputy Surveyor-General.—Meteorological Observations taken at Calcutta for the month of January, 1850.

From General Cullen.—Abstract of Meteorological Observations taken at Trevandrum for January, 1850.

From Major LeGrand Jacob, Sawunt Warree.—Meteorological Observations for February, 1850.

Letters.—From S. P. Cassella and Co., dated London, 8th September, 1849.—Offering their services in making or supplying instruments.

From J. G. Lumsden, Esq., Secretary to Government, dated 5th February, 1850.—Presenting the Society with a number of plans.

From Captain J. Ramsay, Military Secretary to Governor-General, dated 2nd February.—Intimating the Marquis of Dalhousie's accepting of the appointment of Honorary Patron, and his anxiety to promote the objects of the Society.

From R. N. C. Hamilton, Esq., dated 30th January, 1850.—Accompanying his paper on the Transport of Coal by the Nerbudda.

From the Librarian of the University Library, Cambridge, dated 29th December, 1849.—Acknowledging the receipt of a set of the Society's Transactions.

From Mr Mayes, Aden.—Concerning Papers for the Tide-gauge.

From J. H. Barnes, Esq., Acting Clerk, dated Kotree, Scinde, 18th January, 1850.—Requesting information regarding a paper published in the Society's Transactions.

From Colonel Sabine, Foreign Secretary to the Royal Society, dated August, 1849.—Acknowledging the receipt of a set of the Society's Transactions.

From C. J. Erskine, Esq., Deputy Secretary to Government, dated 15th February 1850.—Accompanying No. II. Vol. III. of the Journal of the Indian Archipelago and Eastern Asia.

From Commander C. W. Montriou, I. N.—Accompanying Meteorological Register for November and December, 1849.

From Commander C. W. Montriou, I. N.—Requesting that his and Mr W. Montriou's name be withdrawn from the list of members of the Society.

From Captain S. B. Haines.—Advising of having remitted an order for Rs. 15 in payment of subscription for the year 1849-50, dated 23rd February, 1850.

From J. Murray, Esq., L. W. 29th Regt. N. I., dated Larkhana, 19th February.—Desiring to be furnished with a self-registering Maximum and Minimum Thermometer on separate mountings, and a good common Thermometer, and enclosing a cheque for Rs. 16.

From J. Gilmore, Esq., dated Camp Bumari.—Concerning the formation of Laterite of flexible Sandstone, &c.

From A. Ayrton, Esq., Bo. Artillery, dated Malligaum, 7th March 1850.—Desiring to be furnished with a Copy of the Admiralty Manual.

From J. Ritchie, Esq., dated Bombay, 2nd March 1850.—Enclosing a letter addressed to him by the Secretary of the P. & O. S. N. Co., intimating that the Board of Directors had awarded the sum of one hundred guineas towards the testimonial in honor of the late Captain D. Ross, and stating that he will be happy to pay over the amount whenever called upon.

From N. W. Dalzell, Esq., dated Banda, 13th January 1850.—Concerning taking Meteorological Observations, and stating that he will not be able to set the tide gauge up in working order until his return to Vingorla for good.

From Mr Mayes, Aden, dated 27th February 1850, accompaning and concerning his observations.

From T. F. Courtenay, Esq., dated Point de Galle, 8th February 1850.—Fearing that the former letter had not reached us, again begs to acknowledge the receipt of the Society's communication to the Governor-General, and stating that his lordship has great pleasure in accepting the honorable post in relation to that Society, which it was proposed to confer upon him, and by Lord Dalhousie's desire, stating that his lordship will ever be happy to afford such aid to the researches of the Society in India, as his influence may enable him to command.

From Commander Montriou, I. N., dated 16th March 1850.—Accompanying his Tidal papers.

From Major LeGrand Jacob.—Accompanying his Meteorological paper.

THE ordinary monthly meeting of the Geographical Society was held in their rooms in the Town Hall on Thursday the 18th April.—Present: Commodore S. Lushington, R.N., in the chair; Captain Hawkins, I.N.; Major J. Holland; Commanders G. Jenkins and R. Ethersey, I.N.; Professor J. Patton; J. Smith, N. Oliver, T. J. A. Scott, J. Ritchie, and Manockjee Cursetjee, Esquires; and Dr G. Buist, Secretary.—Commodore Lushington, on taking the chair, said that it was their custom on certain occasions to make one class of motions before the minutes were read, and he begged to move—

"That the Society do record its deep regret for the loss of the Venerable Archdeacon Pigott, one of the ablest of its members, and who, at all times, when able, shared largely in its proceedings.—He died at sea, on the 24th February."

This was seconded by Commander Jenkins, and carried unanimously.

The minutes of last meeting were read and approved of. The Assistant Secretary then read a circular, meant to have been sent round to the General Committee, but which, in consequence of the absence of the Hon'ble the President, Mr Willoughby, had only been seen by a few of the members. The circular contained an outline of the state of matters as concerned the "Ross Testimonial"—the state of the Observatories under the Society—and an account of the papers that had been presented them since last meeting—the whole offering a highly gratifying view of their arrangements.

Commander Jenkins then laid the following letters on the subject of the "Ross Testimonial" before the meeting, —accompanying them with various observations in reference to the steps adopted by him to carry out the object in view :—

DEAR SIR,—I have much pleasure in transmitting you the enclosed copy of a letter received by me from the Secretary of the Peninsular and Oriental Steam Navigation Company, intimating that the Board of Directors had awarded the sum of One Hundred Guineas (Rs. 1050) towards the Testimonial in honor of the late Captain D. Ross. I will be happy to pay over the amount whenever called upon.—I am, my dear Sir, your most obedient servant,

Bombay, 2nd March, 1850. JOHN RITCHIE.

Dr G. Buist, LL.D., &c. &c. &c., Secretary to Committee.

(Copy.) Peninsular and Oriental Steam Navigation Company.

JOHN RITCHIE, Esq., Bombay. London, 24th January, 1850.

DEAR SIR,—The Board of Directors have had under their consideration the subject of the Testimonial to Captain Ross, which, according to the letter of Mr Griffith Jenkins to you, is to consist of a collection of Hydrographical information relative to all parts of the Globe, to be placed in the Town Hall of Bombay for public benefit; and, looking to the object and useful character of the proposed Institution, the Directors have awarded the sum of One Hundred Guineas (£105) in furtherance of its establishment, and you are accordingly authorized to place this amount at the disposal of the Committee appointed for the purpose.

I am, dear Sir, yours truly,

(Signed) C. H. HOWELL, Secretary.

Admiralty, 19th October, 1849.

Sir,—In the temporary absence of the Hydrographer, Sir Francis Beaufort, it becomes my duty to acknowledge the receipt of your letter to him of the 4th of August, on the subject of the Ross Testimonial.

My first care in doing so must be to assure you how fully he participates in the feeling which has given rise to the intention expressed in your letter, and how gladly on the part of the Admiralty he will assist the Committee with the resources of his office in establishing a Testimonial so useful as that which you propose, and which must tend to promote the commercial and naval interests of India.

Referring, then, specially to the charts constructed from the numerous costly surveys which have been made by command of the Lords Commissioners of the Admiralty since the establishment of this office, a selection from which I am directed by the Hydrographer to inform you will be presented by him to the Ross Testimonial,—I herewith enclose for your information, an estimate, from a well qualified person, of the expence of placing these charts on rollers, and fixing them in boxes against a wall for their preservation. But I may also add, that in the opinion of Admiral Sir Charles Malcolm, as well as of Sir Francis Beaufort, the purposes of reference will be better answered, and a proper economy secured, if the method adopted in the library of the Royal Geographical Society were followed by you; being simply that of flexible thin covers, including small portions, separated according to the Navigation, and kept in close drawers numbered for reference. They may thus be placed on a table for use when required, and returned when done with.

Such details, however, are left to your Committee to decide on, and if you will have the goodness to communicate their wishes to Sir Francis Beaufort, as to the adoption of either of the plans, or whether having the charts single would be preferred, I will take on myself to assure you that those wishes shall receive immediate attention.

I leave it to the Hydrographer to reply hereafter to the other points alluded to by you, and assuring of the satisfaction which I derive from making this communication,—I remain Sir, your very humble servant,

A. B. Becher,
Commander, R. N.

Captain Griffith Jenkins, E. I. N.

Sir,—I beg to inform you that the price of mounting plans or charts will be 7s.6d. per foot on back boards and spring rollers, and in mahogany boxes and spring rollers 10s. per foot. Of course the length of the box or back board is what we shall charge: I must chance what the depth of the Map will be. The mounting of the chart and blank paper at top is included in the above charge.—Yours obediently,

Thomas Malby.

October 13th, 1849.

Admiralty, 5th January, 1850.

Dear Sir,—I have much satisfaction in acknowledging the receipt of your letter, and shall immediately, in compliance with your wishes, give directions for four spring rollers to be prepared for the purpose of containing the four best charts of the four quarters of the world. The charts which will be presented by the Admiralty, as well as their arrangement, will form the principal subject of my next, as this is intended simply as an acknowledgment of the receipt of your letter of 3rd December; and with every wish for the completion of the very useful and important object which you have in view, I am, my dear Sir, yours faithfully,

A. B. Becher.

Madras, October 12th, 1849.

My Dear Sir,—I regret exceedingly that my best wishes and earnest endeavours have failed in promoting the good object you have in view.

Having known my valued friend Captain Ross ever since 1808, and knowing from my own experience in the China seas the pre-eminent services which Captain Ross has rendered to the world at large, I assure you that my own inclination and feelings were all in favor of the tribute of respect which the Society of Bombay have worthily conferred,—but the enclosed note from an old friend of your brother's plainly tells the general feeling here.—Captain Newman will pay you his and my subscription, viz. thirty-five Rs.—Believe me to be, sincerely yours,

Chris. Biden.

To Captain Jenkins.

Government House, Guindy, Madras, 10th August, 1849.

My Dear Jenkins,—I have the pleasure to acknowledge the receipt of your letter of the 1st instant, which, with one of its enclosures, I have submitted to Sir Henry Pottinger. He has told me to insert his name in the list, and I have with pleasure added my own. Sir Henry, however, desires me to observe that he does not think the Prospectus is at all calculated to secure the support of any but the inhabitants of Bombay, or, more properly I should say, of the members of the Geographical Society, for whose chief benefit the Testimonial appears to be intended. As the best means of circulating the subscription lists among those who are likely to put down their names, I have sent them to Captain Biden, our Master Attendant, and I shall be very happy to use any influence I may possess here to increase the number of subscribers. With my kind regards, believe me to be, yours very sincerely,

Richard Woosnam.

TESTIMONIAL IN HONOR OF THE LATE CAPTAIN D. ROSS, I. N., F. R. S. LATE PRESIDENT AND HONORARY PRESIDENT OF THE BOMBAY GEOGRAPHICAL SOCIETY, AND SURVEYOR-GENERAL OF INDIA.

TO RECORD HIS GREAT PUBLIC SERVICE,

To consist of his Portrait, value £50, and of a complete Set of Charts of the World; and such other works of Nautical Geography as the Funds may supply; to be placed in the Rooms of the Geographical Society, Town Hall, Bombay.

COMMITTEE ELECTED TO CARRY OUT THIS TESTIMONIAL:

The Hon'ble J. P. WILLOUGHBY, Esq.
Commodore HAWKINS, I. Navy.
Commander JENKINS, I. Navy.
Dr. GEORGE BUIST, LL.D., F. R. S. L. & E., F. G. S. &c., Secretary to the Geographical Society, and to the Committee.

The Hon'ble J. P. Willoughby, Esq.. ... ...Rs.	25	Paid.
His Excellency Admiral Sir Francis Beaufort. (Hydrographer to the Admiralty)...		
Captain Beecher, R. N. (Assistant Hydrographer).....		
Admiral Sir Charles Malcolm...		
Lords Commissioners of the Admiralty...		
Sir Charles Forbes...	100	Paid.
Dr. J. Burnes, K. H...	25	Paid.
Commodore Hawkins...	25	Paid.
Captain Ethersey, Indian Navy..	25	Paid.
Captain H. J. Barr.....	25	Paid.
The Venerable Archdeacon Pigott...	25	
Dr. James Winchester...	25	Paid.
Lieutenant A. D. Taylor, Indian Navy.....	20	
Lieutenant Manners, Indian Navy...	10	
Norman Oliver, Esq...	20	Paid.
Captain S. V. W. Hart...	20	Paid.
Commander Griffith Jenkins	25	Paid.
John Smith, Esq..	25	Paid.
Captain E. Jones. (Ship Prince of Wales)...		
Captain Evan Evans. (Ship Charles Grant)...	10	Paid.
Captain J. L. Wadge (Ship Sultana)..	10	
Captain Fitzmaurice. (Ship Jamsetjee Jejeebhoy)...	10	
Captain Wills. (Ship Charles Forbes)...	10	
Manockjee Nusserwanjee, Esq...	25	Paid.
T. F. Gray, Esq...	25	Paid.
Captain Sanders, I. N...	25	Paid.
A. Remington, Esq...	25	Paid.
Commander Montriou...	20	Paid.
Nowrojee Jamsetjee, Esq. (Late Master Builder)...	20	Paid.
Cursetjee Rustomjee, Esq. (Master Builder,)..	25	Paid.
Jehangeer Nowrojee. Esq. (Assistant Master Builder)...	10	Paid.
Heerjeebhoy Merwanjee, Esq. (Assistant Master Builder)...	7	Paid.
Nanabhoy Nowrojee, Esq. (Draughtsman)...	7	Paid.
Dosabhoy Merwanjee, Esq. (Ditto Dockyard)..	5	Paid.
Mr. Octavius Child, Indian Navy.....	10	
A. Cursetjee, Esq. (Chief Engineer and Inspector of Machinery)...	25	Paid.
Manockjee Limjee Bomanjee...	25	Paid.
Limjee Manockjee...	25	Paid.
A. Malet, Esq...	25	Paid.
H. Cormack, Esq...	25	Paid.
John Vaupell, Esq..	15	Paid.
S. S. Dickinson, Esq...	25	Paid.
Colonel G. Moore...	25	Paid.
Dr. B. A. Bremner..	25	Paid.
Captain Winn. (Ship Orestes)...	10	Paid.
Colonel Melvill...	25	Paid.
Colonel Campbell..	25	Paid.
Major Holland..	10	Paid.
E. H. Townsend, Esq...	15	
J. G. Lumsden, Esq..	25	Paid.
Sir Jamsetjee Jejeebhoy, Kt..	25	Paid.
Cursetjee Jamsetjee, Esq...	25	Paid.
Rustomjee Jamsetjee, Esq..	20	Paid.
Sorabjee Jamsetjee, Esq...	20	Paid.
C. Morehead, Esq., M. D..	25	Paid.
H. Giraud, Esq., M. D..	10	
The Hon'ble D. A. Blane...	25	Paid.
Manockjee Cursetjee, Esq....	20	
Ali Mahomed Khan, Esq...	25	Paid
Professor Joseph Patton...	10	Paid
Mahomed Ali Rogay, Esq. (By Sir Jamsetjee Jejeebhoy, Kt)...	25	Paid

Cursetjee Furdoonjee, Esq. (Ditto Ditto)..	Rs. 20	Paid.
Cursetjee Ardaseer, Esq...	15	Paid.
Cowasjee Jehangeerjee, Esq...	15	
Ardaseer Cursetjee Dadee, Esq...	10	Paid.
Dadabhoy Pestonjee, Esq...	15	Paid.
Muncherjee Pestonjee, Esq...	15	Paid.
Cursetjee Dadabhoy, Esq...	10	Paid.
Pestonjee Dadabhoy, Esq..	10	Paid.
Byramjee Jejeebhoy, Esq...	10	Paid.
Framjee Cowasjee, Esq.	10	Paid.
Pestonjee Framjee, Esq.....	5	Paid.
Nanabhoy Framjee, Esq.....	5	Paid.
Framjee Nasserwanjee, Esq...	20	Paid.
Dhunjeebhoy Framjee, Esq...	10	Paid.
Sorabjee Framjee, Esq..	10	Paid.
Muncherjee Jamsetjee, Esq..	10	Paid.
B. and A. Hormusjee, Esqs...	25	Paid.
Munmohundass Davidass, Esq...	10	Paid.
Jugonnath Sunkersett, Esq...	25	Paid.
C. J. Erskine, Esq....	25	Paid.
Pursotum Runsordjee, Esq. (Master Attendant's Dept.)...	5	
Thomas Cowie, Esq...	25	Paid.
Venayekrao Jugonnath, Esq...	25	Paid.
The Honorable Sir Wm. Yardley.....	25	Paid.
The Honorable Captain Byron Cary, R. N....	20	Paid.
Captain Foreman. (Opium Inspector.).....	10	Paid.
Lieutenant Etheridge, I. N.....	5	
Dadabhoy Rustomjee Cowasjee, Esq., Patel.....	15	Paid.
Jehangeerjee Cowasjee, Esq., Patel.....	10	Paid.
Pestonjee Hormusjee Cowasjee, Esq.....	5	Paid.
Bomanjee Framjee Cama and Co.....	10	Paid.
Cursetjee Nesserwanjee Cama, Esq.....	10	Paid.
Muncherjee Framjee Cama, Esq.....	10	Paid.
Lieutenant Tronson, I. N.....	5	
Captain S. Lushington, R.N. (Superintendent I. N.).....	25	Paid.
R. Willis, Esq	15	Paid.
Captain Chris. Biden, E. I. C. S., (Master Attendant, Madras).....	25	Paid.
Captain A. Newman	10	Paid.
Merwanjee Nusserwanjee.....	10	Paid.
Captain A. McLean. (Ship Nepaul).....	5	Paid.
Captain James Bannatyne. (Ship Glenelg).....	10	Paid.
Lieutenant Twynam, Indian Navy.....	5	Paid.
The Right Hon'ble Major-General Sir H. Pottinger, G. C. B., Governor of Madras...	25	
Dr. Woosnam. (Private Secy to the R. H. the Governor of Madras).....	25	
Captain Rogers, Indian Navy. (Superintendent of Marine, Bengal).....	25	
Lieutenant Fell, Indian Navy. (Surveyor, Bengal).....	25	
Lieutenant Grounds, Indian Navy.....	25	
Roderick Mackenzie, Esq.....	25	Paid.
A. H. Campbell, Esq.....	25	Paid.
R. Strong, Esq.....	25	Paid.
Peninsular and Oriental Steam Navigation Company.....	1050	
Lieutenant C. H. Walker, I. N.....	5	
R. Duins, Esq, (Opium Inspector).....	5	
D. McCulloch, Esq.....	25	

The following motions were then put :—

Moved by Commander Jenkins, seconded by Captain Hawkins, and agreed to unanimously—"That the sum of £50 be placed at the disposal of Colonel Lloyd, C. B., Bombay artillery, to be expended on a Portrait of Captain Ross, for the use of the Society.

Moved by Commander Jenkins, seconded by Captain Hawkins, and carried by a majority—"That the sum of £200 be remitted to Admiral Sir Francis Beaufort, to be expended on the fitting up of the four large Charts of the four quarters of the World referred to in Captain Becher's letter, and for framing such of the other charts as require fitting up or framing."

The discussions connected with this matter having occupied the greater part of the time of the Society, the consideration of the other business before the

meeting was deferred. The following were laid on the table, but allowed to lie over :—

BOOKS.—Presented by the author, Colonel C. W. Grant—"Bombay Cotton and Indian Railways."

Presented by Government.—"The Journal of the Indian Archipelago and Eastern Asia," for January 1850.

Presented by Government—206 Maps, plans, and charts, and three books of directions, viz., "Directions intended to accompany the chart of the South Coast of China"—"Sailing directions for the Red Sea," and "Sailing directions for the Red Sea and the Chagos Archipelago."

PAPERS.—From Mr Mayes, Aden, through Captain Haines—Tidal and Meteorological Observations for the month of February 1850.

From Captain H. L. Thuillier, Deputy Surveyor General—Meteorological Observations taken at Calcutta in the month of Feb. 1850.

Presented by the Government.—Papers on the Roads in Malwa.

From Commander C W. Moutriou.—Abstract of Meteorological Observations, made at the Magnetic Observatory, Colaba, Bombay, during the months of January, February, March, and April, 1849

Presented by the Madras Government.—Meteorological Observations made at the Meteorological Bungalow on Dodabetta, in the years 1847-48.

From General Cullen.—Abstract of Meteorological Observations taken at the Trevandrum Observatory, during the month of February 1850.

Presented by the Government—State of the Thermometer in the shade at Peshawur for January, and on the march under double canvas for February 1850—by J. P. Malcolmson, M. D.—Observations made at Pahlunpore for the months of January, February, and March, by R. Collum, Esq., M. D.—Observations made at Bhooj for January, February, and March, by J. Winchester, Esq., M. D.—Observations made at Sattara, for the months of January, February, and March, by C. G. Wiehe, Esq., M D.—Observations made at the Civil Hospital, Kolapoor, during the months of January, February, and March, by F. Broughton, Esq., M. D.

From W. P. Gillanders, Esq., M. D.—Observations made at Ahmedabad during the month of March 1850.

From Major LeGrand Jacob—Observations made at Sawunt Warree during the month of February 1850.

LETTERS.—From Mr William Mayes, in charge of the Observatory Aden, dated 28th March 1850, regarding the state of the Tide Gauges.

From W. Grey, Esq., under Secretary to the Government of India, dated 22nd March 1850, requesting to be furnished with 300 copies of the Manual of Instructions.

From J. G Lumsden, Esq., Secretary to Govt., dated 11th April 1850, presenting the Society with No. 1 of Vol. 4 of the "Journal of the Indian Archipelago and Eastern Asia."

From Capt. A. B. Kemball, Assistant Resident Persian Gulf, dated Bagdad, 16th February 1850, remitting Rs. 15 as his subscription for the year 1849-50.

From Commander C. W. Moutrio u, in charge of the Observatory, dated 15th April 1850, accompanying an abstract of Meteorological Observations for January, February, and March, 1849

From Captain J. Campbell, 7th Madras Cavalry, dated Nowgong, 11th April 1850, desiring the Society's assistance on behalf of an Infant Society, instituted on the 4th of February last, of which he gives full particulars.

Mr T. Holcroft was proposed by Commodore Lushington as a member of the Society, seconded by Mr Scott, and duty elected.

The meeting then adjourned.

THE Annual General Meeting of the Bombay Geographical Society took place in their rooms in the Town Hall, on Thursday the 17th May. Present:—The Hon'ble J. P. Willoughby, in the Chair. Commodore Lushington, Commander G. Jenkins, Capt. P. T. French, Dr. B. White, T. Holcroft, Esq., Lieut. Taylor, I. N., Norman Oliver, Esq., J. Stockham, Esq., I. N., Captain J. C. Hawkins, I. N., T. J. A. Scott, Esq., John Ritchie, Esq., John Smith, Esq., Ali Mahommed Khan, Esq., Manockjee Cursetjee, Esq, Venayekrao Juggonathjee, Esq., and Dr. Buist, *Secretary*.

The Secretary, having read the minutes of last Meeting, stated that the whole of the motions then brought forward were nugatory, the notice required by the regulations not having been given. He also stated that, having made the gentleman who brought forward the motion on a former occasion, aware of this, and being apprehensive that further delays might occur, he had put two motions on the notice list, purposely to keep the question open: either of these he would, if desired, bring forward—or he would withdraw them or leave them in the hands of any member who wished to take them up, as seemed most suitable. The Society must be aware of the extreme inportance of adhering to its own regulations: were a motion now brought forward to set aside a standing order, on any future occasion the whole regulations might be set aside *brevi manu* by a vote of the Society—the present being quoted as a precedent. After some conversation on the subject, the following motions were brought forward:—

Proposed by Commander Jenkins, and seconded by Captain P. T. French, late Resident at Baroda:—

"That the Society, in terms of the Resolution of the 16th August, proceed to the consideration of the best mode of disposing of the money subscribed for the 'Ross Testimonial.'"

Proposed by Commander Jenkins, seconded by Captain Hawkins and Norman Oliver, Esq., and carried:—

"That £ 200 be forwarded to Admiral Sir Francis Beaufort, Hydrographer to the Admiralty, to defray the expences of obtaining the four magnificent Charts alluded to in letter No. 3, [read before last meeting] and of defraying the expenses of mounting the Admiralty Charts in the manner recommended in letter No. 1, and that he be entrusted with the disposal of the balance."

Proposed by Commodore Stephen Lushington, R. N., Commander-in-Chief Indian Navy, seconded by Commander Griffith Jenkins, I. N., and carried unanimously:—

"That this Society do express their thanks to Admiral Sir Francis Beaufort, Hydrographer to the Admiralty, Admiral Sir Charles Malcolm, and to Captain Becher, R. N., of the Admiralty, London, for the cordial interest they have exhibited in carrying out the objects of the Society with respect to the 'Ross Testimonial.'"

Proposed by Commander G. Jenkins, I. N., and seconded by Captain J. C. Hawkins, I. N., and Norman Oliver, Esq.—

"That the Secretary be authorised to draw and remit £250, from the funds of the Ross Testimonial, to Colonel Lloyd, £50 for the Portrait of Captain Ross, and £200 to Admiral Sir Francis Beaufort, to defray the expenses of the Charts as specified in motion No. 1."

The business of last monthly meeting having thus been disposed of, the minutes of the Annual Meeting of last May were read. The Secretary, in laying before the Society an account of its affairs, and narrative of the operations of the past year, stated that all the instructions given him on a former occasion had been carried into effect. The Society was encreasing in numbers, and its funds were improving in prosperity—there being above Rs. 3000 now in hand, or due by Govern-

ment on account of observations, or by parties on account of instruments. The Instruments had been delayed for a short time for the purpose of being inspected by the Members of the Society—they had been carefully examined, and seemed to afford much satisfaction. The Secretary was authorised to retain the Aneroids for some weeks from those who had purchased them, to make further experiments at different elevations. Up to 1000 feet they coincided to a miracle with the Barometer—at 4500 and 6000 feet they seemed so very considerably out that it was matter of much importance to determine when the disparity began. So far as hitherto apparent, they seemed to suit well for marine purposes—but if incorrect at lower than 29 inches, they might lead to sad mistakes in the event of a hurricane, when the depression due to the mercury was sometimes 28·000. The work performed in the course of the year was large in amount and important in character, and they had now secured co-operation in their physical researches from all parts of India. The following Report was then read by the Secretary :—

REPORT ON THE AFFAIRS OF THE SOCIETY FOR THE YEAR 1849.

In compliance with the instructions given last year, I have drawn up the following Report on the state of the Library Books, Instruments and Papers, belonging to the Society, and added a short outline of our operations within the year. As we have since May 1849 received no accounts of Surveys, or of the discoveries of travellers, in the quarter of the world to which our operations chiefly extend, nothing worthy of the name of narrative as to the progress under our auspices of Geographical Research could be attempted.

STATE OF THE SOCIETY AS TO MEMBERS.—At last Anniversary Meeting the Society had 76 Members on its *list*: including those now in Europe, we have this season 86, or ten more than last year. We have since then lost one member (the Venerable Archdeacon Pigott) by death, one (Dr Patch) has resigned on returning home, four (Commander Montriou, Mr Montriou, Mr Waterston, and Dr Giraud) have withdrawn, and five have returned to England—so that on the whole, our paying list has increased by thirteen, and decreased by ten for the present,—leaving a balance of three in our favour. Our late distinguished President, Captain Ross, having intimated his desire to retire from office, and the hope of his re-appearing amongst us being precluded by reason of his advancing years and infirmities, he was on the 18th of June raised to the rank of Honorary President,—the same as that which our first President, Sir C. Malcolm, had conferred on him on his retirement from India, and which he still continues to hold. At a subsequent meeting it was resolved to open a subscription among the Members of the Society for providing a Portrait of Capt. Ross, with such other additional Testimonial as the Society might determine,—and a great desire having been expressed that parties not members of our body should be permitted to subscribe, the subscription was then thrown open, the administration of the funds to rest with the Society, who determined that they should await the issue of the subscription before taking into consideration the manner in which it might best be bestowed : and the question still remains open to decision.* The most munificent contributions to the testimonial was that of H. M.'s Lords of the Admiralty, who undertook to bestow a selection of the Charts issued from the Office of the

* The following resolutions passed at the meeting before which the report was laid, provided for the disposal of the bulk of the funds :—

Moved by Commander Jenkins, seconded by Captain Hawkins, and agreed to unanimously—"That the sum of £50 be placed at the disposal of Colonel Lloyd, C. B., Bombay artillery, to be expended on a Portrait of Captain Ross, for the use of the Society."

Moved by Commander Jenkins, seconded by Captain Hawkins, and carried by a majority—"That the sum of £200 be remitted to Admiral Sir Francis Beaufort, to be expended on the fitting up of the four large Charts of the four quarters of the World referred to in Captain Becher's letter, and for framing such of the other charts as require fitting up or framing."

Hydrographer, of an estimated value of £300,—the Peninsular and Oriental Steam Navigation Company having contributed one hundred guineas to the fund. On the advancement of Captain Ross, a gentleman who had long as Vice-President laboured with his usual ability, assiduity, and effect, was raised to the Chair—the Hon'ble J. P. Willoughby; the Commander-in-Chief of the Indian Navy taking the position rendered vacant by his advancement; Colonel Melvill and Captain Hawkins having been elected Vice-Presidents in May. On his retirement from India, Dr Burnes, Physician-General, and formerly a Vice-President of the Society, was, on the motion of Commander Jenkins, elected Honorary Vice-President. The interest evinced in our proceedings by the Marquis of Dalhousie on his visit to the Presidency, caused him to be raised to the rank of Honorary Patron, formerly on a like consideration conferred on Lord Auckland: on this, as on the former occasion, the arrangement was made through our Patron, the Right Hon'ble the Governor. The Governor-General, in accepting a copy of our *Transactions*, and complying with our request, expressed his anxiety to assist in any way within his power in the advancement of the objects the Society had in view.

LIST OF MEMBERS OF THE SOCIETY.

President.

The Hon'ble J. P. Willoughby, Esq.

Vice-Presidents.

1 Commodore Stephen Lushington, R. N.
2 Colonel P. M. Melvill.
3 Captain J. C. Hawkins, I. N.

Resident Members.

1 Major J. Holland.
2 C. Morehead, M. D.
3 Commander R. Ethersey, I. N.
4 Captain H. J. Barr.
5 Commander G. Jenkins, I. N.
6 Professor J. Patton.
7 Colonel George Moore
8 C. J. Erskine, Esquire.
9 Colonel Neil Campbell.
10 S. S. Dickinson, Esquire.
11 The Hon'ble D. A. Blane, Esq.
12 Henry Cormack, Esq.

Non-Resident Members.

1 Major G. LeGrand Jacob,.. Sawunt Waree.
2 Captain George Fuljames,. Ahmedabad.
3 R. K. Pringle, Esq., ... Kurrachee.
4 Captain E. DelHoste,.. .. Phoonda Ghat.
5 Major H. C. Rawlinson,.. Baghdad.
6 Major P. T. French,..... Baroda.
7 Dr E. Impey,..... Indore.
8 Lieut. C. J. Cruttenden, I.N., Aden.

Members.

Ali Mahomed Khan, Esq.,
Allan, W. G., Esq.,
Blane, Hon'ble D. A.,
Bremner, B. A., Esq., M. D.,
Baker, W. E., Major,
Barr, D., Major-General,
Bradley, Dr.,
Cardwell, T., Esq., (Europe.)
Carr, T., The Right Revd. Lord Bishop of Bo.
Cormack, Henry, Esq., [(Europe.)
Constable, Lieutenant J. G., I. N.,
Conybeare, Henry, Esq.,
Collier, C. F., Dr.,
Dhunjeebhoy Framjee, Esq.,
Dickinson, J., Esq.,
Elliott, E. E., Esq.,
Evans, W. E., Lieutenant, (Europe.)
Evans, E. E., Esq., (Ship Charles Grant)
Fouterton, Lieutenant A., I. N.,
Felix, O., Lieutenant-Colonel,
Ford, C. G. E., Dr.,
Frere, W. E., Esq.,
Gribble, H., Captain, (Europe)
Grieve, A., Lieutenant, I. N.,
Holcroft, T., Esq.,
Howard, W., Esq.,
Haines, S. B., Captain, I. N.,
Harrison, C. M., Esq.,
Harrison, W. H., Esq.,
Hart, S. Y. W., Captain,
Jenkins, T. L., Esq.,
Joseph, M., Esq.,
Jacob, Major, John,
John, R. St., Major,
Jones, A. F., Commander, I. N.,
Kayes, M. T., Dr, M. D.,
Kempthorne, G. B., Commander, I. N.,
Kemball, A. B., Lieutenant,
Kemball, Lieutenant J. S.,
Lancaster, T., Esq.,
Lumsden, J. G., Esq.,
Law, J. S., Esq.,
Malet, A., Esq.,
Manockjee Cursetjee, Esq.,
Munmohundass Davidass, Esq.,
Macleod, John, Esquire,
Oliver, Norman, Esq.,
Phayre, R., Lieutenant,
Remington, R. F., Esq.,
Ritchie, John, Esq.,
Robertson, G. H., Captain,
Saunders, J. P., Captain, I. N., (Aden)
Scott, T. J. A., Esq.,
Smith, John, Esq.,
Stockham, J., Esq., I. N,
Spens, A., Esq.,
Smart, W. S., Captain,
Taylor, A. D., Lieutenant, I. N.;
Townsend, E. H., Esquire,
Vaupell, John, Esq.,
Vonvyekrow Juggonathjee, Esq.,
White, Dr. B.,
Winchester, J. W., Dr,
Wingate, G., Captain.

We have learnt with much regret in the course of the year that the Admiralty Grant of £350 has been cut down to £100, and that this has been entrusted to the management of the Court of Directors and wholly estranged from the Society. I speak without information further than this on the subject, but to me it appears that the unhappy change has arisen in consequence of the delays which have occurred amongst ourselves. The entire sum was offered to be made over to me for the purchase of instruments in October 1845—it was not till April 1849 that our own arrangements on the spot were completed: need we wonder that in this time the patience of the Admiralty was worn out?

A Catalogue of the Library was completed in the course of the monsoon: on being placed in the hands of the Society it was not deemed expedient to incur the expense of printing it for the present. For the past ten years scarcely any books have been purchased by us save what have been deemed requisite for the advancement of our pursuits. We have in the course of the year obtained a copy of Johnstone's Physical Atlas—we had possessed a copy of his Commercial Atlas before; and we have also purchased a copy of Layard's Nineveh, with the drawings and illustrations—the only copy of this last as yet in Bombay.

The application made to Government shortly before last annual meeting for sets of all the spare Charts and Maps in their possession, has been munificently responded to by a donation of betwixt 300 and 400 sheets, including all the survey charts of the Indian Navy, surpassed in excellence it is believed by none in existence in the world; all the published sheets of the maps of the Trigonometrical Survey; with a large number of others of lesser note but still of much value. A beautiful map of Cutchee, compiled from documents in the Quarter-Master General's department—the second most valuable contribution to geography made from the same quarter within two years,—has been presented by Colonel Campbell; and the following is a list of books, papers, and drawings, received from other quarters and added to our stock:—

Books.

By Government.—The Journal of the Indian Archipelago and Eastern Asia for 1849, Volume 3rd, No. 3,4,5,6, and 7. With a letter from J. G. Lumsden, Esquire, Secretary to Government, General Department, No. 1763, dated 26th May 1849.

By the Bombay Branch of the Royal Asiatic Society.—Journal of the Bombay Branch Royal Asiatic Society, No. 12, Volume 3rd, for the month of January 1849.

By Government.—Prinsep's Useful Tables, Parts 1st and 2nd, for 1840 and 1846. With a letter from J. G. Lumsden, Esquire, Secretary to Government, General Department, No. 2164, dated 29th June 1849.

By the Royal Geographical Society of London, through Mr Cannon.—Journal of the Royal Geographical Society of London, Vol. 16th, Part 1st of 1846; Vol. 17th, Parts 1st and 2d of 1847; Vol. 18th, Part 1st of 1848; and of the Royal Geographical Society and its labours.

By the Société de Geographie at Paris, through the Royal Geographical Society of London.—Bulletine de la Société de Geographie, Tome 6 and 7 of 1846 and 1847.

By the Asiatique Societe at Paris, through the Royal Geographical Society of London.—Journal Asiatique ou Recueil de Memoires, Tome 3rd, No. 14, Mai 1844; Tome 5th, No. 24 of Juin 1845; Tome 6th, No. 27, Septembre—Octobre 1845; Tome 6th, No. 28, Novembre 1845; Tome 6th, No. 29, Decembre 1845; Tome 7th, No. 30, Janvier 1846; Tome 7th, No. 31, Fevrier 1846; Tome 7th, No. 32, Mars 1846; Tome 7th, No. 33, Avril 1846; Tome 7th, No. 34, Mai 1846; Tome 9th, No. 42, Mars 1847; Tome 10th, No. 49, Octobre 1847.

By the Secretary.—A History of the Sikhs from the origin of the nation to the battles of the Sutlej. By Captain J. D. Cunningham.

By the British Government.—Magnetical and Meteorological Observations, St. Helena, from 1840 to 1843 (in three books.)

By the Royal Geographical Society of London, through Mr J. T. Bell.—The Journal of the Royal Geographical Society of London, Vol. 18th, part 2nd of 1848.

By the Société de Geographie de Paris, through the Royal Geographical Society of London.—Bulletin de la Société de Geographie, Tome 8th and 9th of 1847 and 1848.

By the Société de Asiatique de Paris, through the Royal Geographical Society of London.—Journal Asiatique ou Recueil de Memoires, &c. &c. Tome 10, No. 50, Novembre, Decembre, 1847; Tome 11, No. 51, Janvier; Tome 11, No. 52, Fevrier; Tome 11, No. 53, Mars; Tome 11, No. 54, Avril, Mai; Tome, 11, No. 55, Juin 1848.

Bought from Smith, Elder and Co., of London:—Layard's Nineveh in 2 vols.; Illustrations to ditto, for £14 13s. 6d., with a letter dated 19th July 1849.

By the Hakluyt Society, through Smith, Elder and Co. of London:—Voyage towards the North West, published in 1849.

By the Medical and Physical Society of Bombay :—A copy of No 9 of the Transactions of the Medical and Physical Society of Bombay, with a letter dated 5th September 1849.

By Captain P. T. French, through Captain S. V. W. Hart :—Memorandum illustrative of a Sketch Map of the route from Tankaria Bunder to Rutlam, in Western Malwa, with the Map.

Presented by Government. "Bombay Magnetical and Meteorological Observations for 1846."

Presented by Government. "An Essay on Female Infanticide. By Cooverjee Rustomjee Mody, late Assistant Teacher in the Elphinstone Institution, to which the prize offered by the Bombay Government for the second best essay against female infanticide among the Jadajas and other Rajpoot tribes of Guzerat was awarded.

By the Ceylon Branch of the Royal Asiatic Society.—Their Journals for 1846, 1847, and 1848, three volumes.

Presented by the Medical Board.—Nos 7, 8, and 9, of the Transactions of the Medical and Physical Society, Bombay.

Presented by the Proprietors of the *Bombay Times*.—"The English and Native Calendar for 1850."

From Smith, Elder and Co.—3 Copies of Riddell's Instructions, with sundry tracts.

Presented by Government.—Documents regarding the Navigation of the Ganges from Allahabad to Rawulgunge.

Presented by James Madden, Esq., 8 Leadenhall Street, London.—"Decline of Geographical. Discovery." By James Richardson.

The Revelations of an Orderly. By Panchkouree Khan.

Arabic Grammar and Dialogues. By Capt. Fletcher Hayes, M. A.

Presented by Dr Buist.—"Dry leaves from Young Egypt." By an ex-Political.

Presented by the author.—J. W. Laidlay, Esquire, V. P, and Secretary A. S. Calcutta.—"The Pilgrimage of Fa Hian."

From the Asiatic Society of Calcutta.—Of their Transactions. Old series, Vols. 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20.—New series, Vols. 8, 9, 10, 11, 12, 13, 14, 15, 16, 17.

By Ship "Owen Glendower.—One copy of Bulletin de la Société de Geographie," third series, Vol. 10.

Presented by the College.—"Annual report of the Grant Medical College for the year 1849-50."

Presented by the author, Colonel C. W. Grant.—"Bombay Cotton and Indian Railways."

Presented by Government.—2-6 Maps, plans, and charts, and three books of directions, viz. "Directions intended to accompany the chart of the South Coast of China."—"Sailing directions for the Red Sea," and "Sailing directions for the Red Sea and the Chagos Archipelago."

PAPERS.

From Mr Mayes, Aden, through Captain Haines.—Tidal and Meteorological Observations for the month of February 1850.

From Captain H.L. Thuillier, Deputy Surveyor General.—Meteorological Observations taken at Calcutta in the month of February 1850.

Presented by the Government.—Papers on the roads in Malwa.

From Commander C. W. Montriou.—Abstract of Meteorological Observations made at the Magnetic Observatory, Colaba, Bombay, during the months of January, February, March, and April, 1849.

Presented by the Madras Government.—Meteorological Observations made at the Meteorological Bungalow on Dodabetta, in the years 1847-48.

From General Cullen.—Abstract of Meteorological Observations taken at the Trevandrum Observatory, during the month of February 1850.

Presented by the Government.—State of the Thermometer in the shade at Peshawur for January, and on the march under double canvas for February 1850, by J. P. Malcolmson. M. D.—Observations made at Palunpore for the months of January, February, and March, by R. Collum, Esq., M. D.—Observations made at Bhooj for January, February, and March, by J. Winchester, Esq., M. D.—Observations made at Sattara, for the months of January, February, and March, by C.G. Wiehe, Esquire, M. D.—Observations made at the Civil Hospital, Kolapoor, during the months of January, February, and March, by F. Broughton, Esquire, M. D.

From W. P. Gillanders, Esq., M. D.—Observations made at Ahmedabad during the month of March 1850.

From Major LeGrand Jacob.—Observations made at Sawunt Warree during the month of February 1850.

By Government.—A report on "Toran Mal," in the Satpoora mountains, in the Sultanpoor talooka of the collectorate of Khandeish, dated camp at Shada, the 28th April, 1849. By Lieut. C. P. Rigby, Western Bheel Agent. With a letter from A. Malet, Esq., Chief Secretary to Government, Political Department, No. 2574, dated 14th June instant.

By Captain Jacob, 19th Bombay N. I., forwarded by Government—on a remarkable Hail-storm at Shunkerghur, sixteen miles North of Peshawur, on the 22nd September.

By Captain Fenwick, forwarded by Government.—Journal of a passage down the Nerbudda, from Chikuldah to Broach, with notices of the most important obstructions to the navigation.

On the Geology of the Bombay Presidency. By Dr Coilior. With Maps, Drawings, and a large assortment of specimens.

On the Akranee Pergunnah. By Lieut. Rigby.—Presented by Government.

Route from Scinde to Peshawur. By Lieut. Raverty, 9th Bombay N. I.

By the Author, through Captain S. B. Haines, I. N., Political Agent at Aden. Tidal and Meteorological Observations as taken at Shum Shum and Scerah Island, at Aden, from May 1849 to May 1850. By Sergeant W. Mayes.

By the Author, John Caldecott Esquire, F R. S.—Abstract of Meteorological Observations taken at Trevandrum, from May 1849 to May 1850.

Meteorological Register kept at Calcutta from May 1649 to May 1850.

By the author.—Notice of the Climate of Phonda Ghaut, as adapting it for a sanatory station. By Captain E. P. Del'Hoste.

By the Author.—State of the Thermometer in the shade at Peshawur for the month of June 1849, dated camp Peshawur, the 1st July 1849. By Surgeon John P. Malcolmson, 3rd Regiment Bombay Native Infantry.

By John P. Malcolmson, Esquire, Staff Surgeon.—Meteorological Register for Peshawur, during the months of September and October.

By Corporal R. Leech.—Meteorological Register for Kurrachee, during the month of Sept.

By Dr J. I. Murray, Woosung.—Meteorological Observations taken at Woosung, on the 7th and 22nd days of August.

By Government.—Meteorological Journals from December 1845 to April 1849; with a letter from J. G. Lumsden, Esquire, Secretary to Government, dated 31st July, No. 632 of 1849.

By the author, through Major G. Le G. Jacob.—Meteorological Observations for the months of May and June, 1849; with two letters, viz., one from Anunta Ballala, dated Sawunt Waree, the 21st July, and another from Major G. LeG. Jacob, dated 22nd July 1849.

By the Author.—Meteorological Observations as taken as Kurrachee, by Corporal Robert Leach, for the month of July last.

From Woosung.—Atmospheric pressure at the Turning Points of the Barometer, corrected for Temperature at each observation, on the 7th and 22nd May, and 5th and 22nd June 1849.

By Captain E. P. Del Hoste.—Meteorological Register from Phonda Ghat, for the month of August 1849, with a letter dated 11th September 1849.

By the Author, John C. Pye, Esq.—Meteorological Register for Futteygurh for the months of June, July, August, and September, 1849.

Abstract of Meteorological Observations made at the Magnetic Observatory, Colaba, during the months of May, June, July, August, September, and October, with hourly observations on the most remarkable days in the month of January, February, March, April, and May.

Meteorological Register for the month of October, kept at Futteygurh. By John C. Pye, Esq.

Meteorological Observations for the month of October, taken at Kurrachee.—By Corporal R. Leach.

A complete list of all the Maps, Plans, Charts and Drawings, in our possession, had been, in conformity with the directions of the Society, prepared early in the monsoon: the titles of those since received are now being added.

Government having given us permission to make use of the lobby, our collection of specimens has been placed there as proposed: sickness has hitherto prevented me from arranging it in conformity with the plans formerly provided. The walls of the lobby have been in a great measure covered with maps and drawings, and in place of spring rollers, as once suggested, and which are not only expensive but liable in India to become useless from the corrosion or snapping of the springs,—strings and pulleys, at a fraction of the charge, have been found to answer every purpose that could be desired, without any risk of their getting out of order.

The Instruments reported at last General Meeting to belong to the Society, were the following —

4 Mountain Barometers. 1 Barometer. 2 Register Thermometers. 1 Dipping Circle with Needles. 1 Thermometer as Hygrometer. 1 Thermometer as Ætheroscope. 1 Thermometer as Photometer. 1 Drawing box.—Total 12. Probably a more careful examination of the minute and account books than I have as yet been able to bestow on them, might throw more light upon the subject. I observe no allusion in our records to the Transit or Telescope which stand on the invoice of the Observatory as belonging to the Geographical Society. The same is the case with Daniell's Hygrometers in our stores: the only evidence we have that these last are ours is the fact of our possessing them.

There were, besides these, a Transit and a Telescope at the Observatory, believed to be the property of the Society: these on being applied for, were declined to be given up unless we could produce some evidence that they were ours. I was desired to search the records on the subject, but have hitherto been unsuccessful in meeting in with any allusion to the instruments in question. I can find no trace of the four Barometers, which at *one* time belonged to the Society, two of which were received in 1833, the other two in 1844: that still in our possession is a light French instrument on Guy Lussac's principle—it is in good order,

but the cutting of the scale is inconvenient, and it has not for ten years been in use. The two Self-Registering Thermometers have both been sent out—one to Aden, the other to Kurrachee: the maximum of the one has been broken—and both tubes of the other have suffered in the service. When the Ætheroscope, Hygrometer, and Photometer, were last year exhibited, their forms were new to us, and none of us were able to recognize them. I have since found them described in the Madras Literary Journal (Vol. II, 1835, p. 41) as modifications of the differential thermometers of Sir John Leslie bearing these names, invented by the late talented Dr Turnbull Christie, and doubtless selected on his recommendation by our learned and indefatigable late Secretary Dr Heddle. I have not met in with any account of their value or their uses in the service of meteorology, and they have, I suspect, been long superseded by instruments of greater excellence and novelty, however ingenious or valuable they may have appeared to be at the commencement of the Society's researches in meteorology seventeen years ago. The Society had written home early in 1833 for a set of Sir John Leslie's instruments, but in consequence of the death of that distinguished philosopher, only one hygrometer was received. On the receipt of the first supply, on which Rs 400 were expended, a second order for Rs. 400 more was sent home. The Dipping Circle formerly laid before the meeting, which was purchased in 1833, had, as I now find, been in 1836 placed at the disposal of Captain Moresby, with the view of his determining the dip in the Maldive Islands, in the survey of which he was about this time engaged: it was subsequently, by the sanction of the Society, lent to the distinguished astronomer of Madras, Mr Taylor, and employed by him and Mr Caldecott jointly in a magnetic survey of Southern India, published in the Bengal Asiatic and Madras Literary Transactions of 1838. The Needles being rusted and unserviceable, it was sent home for repair, and the large sum of £9 has been charged for putting it in order: it is now in the hands of Mr Mayes at Aden, who has been supplied with a MS. copy of the instructions of Mr Taylor for its use.

INSTRUMENTS PROCURED FOR SALE.—Just this time last year it was suggested to the Committee on Physical Research, that it would be highly expedient for the Society to procure for sale a supply of Sympiesometers for use on ship-board: this being a matter in which many of the vessels whose officers would, were they provided with the means, most willingly assist the Society, were deficient,—the Committee resolved to improve on the suggestion by extending the order to other instruments, and the question having been submitted by Circular to the General Committee, was with one exception concurred in. No sooner did the matter become known than orders for instruments nearly to the full amount of those written for were sent in; and on a further reference to the Committee being made, a fresh supply was ordered to be written for. Mr Adie's hands were full of work at the time our instructions were received—the instruments were shipped in November, but were five months at sea, not having reached us till the 25th April. The supply consisted of the following: the prices set down are those at which we found ourselves able to supply them to applicants:—

	Rs.	As.	P.
3 Aneroid Barometers. (Card) at ... each	38	0	0
2 Do. Do. Metal plates and Thermometers, at each	44	0	0
5 Mountain Barometers, in cases at ... each	69	0	0
5 Improved Marine Do. Do. at ... each	92	0	0
3 Pocket Compasses at ... each	1	12	0
2 Do. Do. at ... each	1	0	0
5 Marine Sympiesometers, at ... each	38	0	0
1 Portable Do. for heights, at ...	51	0	0
10 Lind's Anemometers, at ... each	5	8	0

5 Pairs self-registering Thermometers on separate scales. In cases..... pair	18	0	0
1 Copper boiler for boiling Thermometers for ascertaining altitudes.....	22	0	0
8 Thermometers for boiling temperature, divided into $\frac{1}{8}$ & $\frac{1}{10}$ of degrees, at..... each	21 to 17	0	0
10 Pairs Common Thermometers, at..... pair	13	0	0

The Marine Barometers were on a principle almost entirely new for this variety of instrument, and they were of the utmost beauty, suited either to serve for Marine, for Mountain, or Observatory purposes, and the object in having them thus constructed was this. Though observations made at sea by ships under weigh, and constantly changing their latitude, and the season of their observations, are of comparatively little value, at anchor at any given spot a vessel may with very little trouble be converted into an observatory. The vessels of the Indian Navy, or of the P. & O. S. N. Company—a copartnery which in its devotion to science shames the efforts of many Governments,—frequently lie at anchor for days or weeks at and off Bushire, Bussora, and Bassadore, in the Persian Gulf,—off Jedda and Suez in the Red Sea, off Singapore, and off Hongkong in China. Were each of these periods of repose taken advantage of, and fitting instruments at hand, the Barostices might be obtained, and probably one day's hourly readings for every month in the year, and thus an important step be taken in the elucidation of one of the most important points in meteorology—the determination of the pressure due to each hour of the day and season of the year at every different degree of latitude, so far as our researches could be made to extend. The instruments sent us are eminently well suited for the objects in view, which will, I have no doubt, through their means, and such agencies as those alluded to, be speedily attained. Another object of the utmost importance in Physical Research was proposed to be effected by means such as those in measuring altitudes. For pressure observations on the shores say of the Red Sea or Persian Gulf,—it is next to impossible for a traveller at present to secure a reference barometer.

The Aneroid is an instrument so portable, so compact, and so convenient for travellers, and in reference to which so much diversity of opinion has existed, and so much mystery has been made, that I deem it of importance to give the results of all the information we possess on the subject in the present report. The following observations were made by General Cullen at various elevations from Trevandrum to 6500 feet of elevation: it must be remembered that this instrument was known to be out of order, and these results are rather given to show the amount of error that may be incurred by an unknown instrument than for any other purpose:—

		Aneroid.	Newman's Mountain Barometer.	Therm.
October 3rd, 1849...	9½	28·280	27 820	70°
"	4	·180	·746	72
		·100	·074	
October 7th..... ..	9½	28·275	27·830	70
Descent of a Mountain.	11½	28·475	28·030	74
	12	28·900	28 440	76
	1	29·100	28·826	78
	1½	29·150	29·260	79
	4½	29 600	29·796	77
October 9th.....	9½	29 262	29 300	78
	4	—·200	—·200	80
		·062	·100	

October 10th...	Ascent of a Mountain.	10½	29·100	28·940	80
		12	28·380	27·970	78
		4	27·900	27·250	69
October 11th...		9½	27·935	27·346	70
	Descent of a Mountain.	11	27·950	27·490	74
		1	29·200	28·788	77
		4½	29·250	29·210	78
October 13th..... ...		9½	29·800	29·972	81
,,		4½	29·680	29·850	82
			·120	·122	

The following note from Captain Barr refers to one of the Society's instruments, also out of order: the observations were made at Mahabuleshwar:—

"I received the Aneroid all right, and will with great pleasure keep a register of its readings at 10 A. M. and 4 P. M., and can very easily do so for 6 A. M. and 9 P. M. also, but I can neither promise to go to bed so late as ten nor to get up so early as 3 A. M. I fear the instrument is not a very sensitive one, nor do I think it is correct. Here are the readings for you :—

	10 A. M.	4 P. M.
Saturday 4th.....	27·180	27·220
Sunday 5th.....	27 205	27·187
Monday 6th.....	27·190	27·225
Tuesday 7th.....	27·175	27·170
Wednesday 8th.....	27·190	

"The Aneroid is hung in my drawing-room quite out of the influence of the sun. My reason for saying that I dont think it is a correct instrument is, that I fancy the fall due to our elevation ought to be greater than 27·190. I tried the instrument also the other day by taking it up a hill which is known to measure 200 feet above my own house: it only indicated a fall of ·022, or taking an inch as the measure of 1000 feet, which it approximates, this would have made the hill little more than 20 feet instead of 200."

The following records of observations have been sent to me by Captain Thuillier, Deputy Surveyor-General of India:—

COMPARISON of an Aneroid Barometer, No. 3064, by Dent, with the Standard in the Observatory at Calcutta.

Days.	Time of Observation.	Standard Barometer.	Attached Thermometer.	No. 3064 Aneroid Barometer.	Attached Thermometer.	Difference of Barometer.
Mar. 23	Sunset.	30·070	88·8	30·066		—·004
,, 24	Sunrise.	·096	69·3	·087		·009
	9h. 50m.	·206	89·2	·200		·006
	Noon.	·184	93·7	·175		·009
	2h. 40m.	·110	95·7	·104		·006
	4 P. M.	·096	96·2	·087		·009
	Sunset.	·080	90 2	·066		·014
,, 25	Sunrise.	·100	72·0	·092		·008
	9h. 50m.	·198	84·5	·187		·011
	Noon.	·178	91·3	·172		·006
	2h. 40m.	·108	94·3	·100		·008
	4 P. M.	·082	95·2	·079	Unserviceable.	·003
	Sunset.	·066	90·0	·062		·004
,, 26	Sunrise.	·088	71·8	·087		·001
	9h. 50m.	·184	85·3	·183		—·001
	Noon.	·166	92·7	·166		·000
	2h. 40m.	·098	97·0	·100		+·002
	4 P. M.	·084	97·3	·085		+·001

Dent's Aneroid Barometer No. 3507, compared with the Standard Barometer of the Surveyor-General's Office, Calcutta.

Days.	Time of Observation.	Standard Barometer uncorrected.	Attached Thermometer.	No. 3507 Aneroid Bar. uncorrected.	Attached Thermometer.	Difference of Barometer.	Difference of Thermometer.
		Inches.	°	Inches	°	Inches	°
Jan. 10	Noon.	30·026	75·2	30·025	73·8	—·001	—1·4
	2h. 40m.	29·976	79·3	29·975	77·9	·001	1·4
	4 P. M.	·972	80·1	·966	77·8	·006	2·3
	Sunset.	·970	76·7	·962	74·7	·008	2·0
„ 11	Sunrise.	·992	58·0	·983	57·7	·009	0·3
	9h. 50m.	30·080	70·1	30·075	68·7	·005	1·4
	Noon.	·052	79·2	·041	77·2	·011	2·0
	2h. 40m.	29·994	83·2	29·987	81·6	·007	1·6
	4 P. M.	·990	83·4	·981	81·2	·009	2·2
	Sunset.	·992	79·4	·983	77·4	·009	2·0
„ 12	Sunrise.	30·020	61·8	30·012	61·2	·008	0·6
	9h. 50m.	·122	73·0	·112	71·8	·010	1·2
	Noon.	·100	81·0	·091	78·6	·009	2·4
	2h. 40m.	·030	84·2	·025	82 3	·005	1·9
	4 P. M.	·014	84·0	·008	81·9	·006	2·1
	Sunset.	·018	80·5	·012	78·8	·006	1·7
„ 13	Sunrise.	·056	65 0	·050	64·0	·006	1·0
	9h. 50m.	·160	69·2	·156	67·8	·004	1·4
	Noon.	·128	71·7	·118	69·9	·010	1·8
	2h. 40m.	·064	74·8	·058	72·8	·006	2·0
	4 P. M.	·044	74·7	·037	72·8	·007	1·9
	Sunset.	·040	72·9	·033	71·8	·007	1·1
„ 14	Sunrise.	·076	61·2	·068	60·0	·008	1·2
	9h. 50m.	·140	66·3	·133	64·3	·007	2·0
	Noon.	·112	71·8	·108	69·5	·004	2·3
	2h. 40m.	·036	72 7	·031	70·2	·005	2·5
	4 P. M.	·036	71·4	·031	69·4	·005	2·0
	Sunset.	·028	69·9	·018	68·3	·010	1·6
„ 15	Sunrise.	·034	60·8	·025	59·6	·009	1·2
	9h. 50m.	·138	66·3	·131	64·5	·007	1·8
	Noon.	·106	66·0	·100	63·9	·006	2·1
	2h. 40m.	·036	66·8	·031	65·0	·005	1·8
	4 P. M.	·012	66·4	·008	64·8	·004	1·6
	Sunset.	·010	66·0	·000	64·5	·010	1·5
„ 16	Sunrise.	·046	58·8	·037	57·9	·009	0 9
	9h. 50m.	·138	66·0	·131	64·3	·007	1·7
	Noon.	·110	73·7	·103	71·9	—·007	—1·8

My own opinion of the Instrument, is I confess, not very high, though the experiments I have made with it have all turned out to its advantage. I confess to a prejudice against it, founded on the mystery and misrepresentation we have had from home regarding it, and the difficulty of conceiving an instrument constructed on this principle, at all to be compared with the Torcellian tube. No instructions have been published for the rectification of the Aneroid when it goes wrong; but so long as the Society orders out instruments for observers, it will from time to time have occasion to send those which are injured home, and will no doubt include amongst them any Aneroids which are damaged, to whomsoever they may belong.

The following are the results of an experiment made by me with three barometers and three sympiesometers near Bombay in the beginning of May:—

The survey station at Neat's Tongue, between Trombay and Mehal, exactly 1000·6 feet above the mean level of the sea, as ascertained by theodolite, afforded a very suitable place for experiment; and the collection of instruments in possession of the Geographical Society offered a most convenient opportunity for determining the point. The beautiful standard barometers by Adie, 2, 3, and 5, were with three Aneroids now selected for comparison. Barometer No. 4 was

left at Balcairn, about seventy feet above the level of the sea, and No. 1 in the Geographical Society's rooms, thirty-five feet lower, for reference. The first observation was made at 5 P.M., about half way up the hill, where barometer No. 4 stood at 29·600, temperature 84° ; at Balcairn it had stood at 29·874 at 3 P. M., temperature 86° : it had thus fallen 00·274. The three aneroids stood as follows :—

	No. 3187	No. 1942	No. 1737
Aneroid, 70 feet above sea...	29·945	29·860	29·850
Neat's Tongue...	29·626	29·552	29·560
Difference	·319	·308	·290

Mean ·306. There was no time to try more than one barometer here. On the top of the hill three barometers were made use of exactly as at the survey station—the cisterns were six inches above ground. The following is the result :—

	No. 2	No. 3.	No. 5.
Barometers at Balcairn at 3 P. M...	29·882	29·849	29·874
Barometers at Survey Station at 6 P. M... ...	28·966	28·986	28·984
Difference.	·916	·863	·890

Mean ·889. The temperature at Balcairn was 5° higher than that above : no correction for this was at this stage made :—

Aneroids as above...	29.945	29·860	29·850
	28·900	28·888	28·950
Difference	1·015	·972	·900
Mean ·972	Difference from barometric mean		·083

The following experiments were made at the level of the sea at half tide,—and at Balcairn, on the summit of the rock close by :—

	No. 2.	No. 3.	No. 5
Barometer, lower...	29·934	29·914	29·926
Barometer, upper...	·860	·836	·856
Difference	·076	·078	·070
Aneroid, lower...	29·910	29·830	29·923
Aneroid, upper...	·840	·770	·850
Difference	·070	·060	·073

The mean depression of the Aneroids was thus ·067, that of the Barometers was ·074—difference ·007—seven thousandth parts of an inch. When the difference of level between two places is trifling, one tenth of an inch of depression represents 100 feet, so that Balcairn by this is about seventy feet above the level of the sea. Leisure was not allowed to make any of these observations with the care required : the barometer when carried about in the sun ought always to be allowed to hang in the shade for a sufficient length of time to permit the mercury in the cistern and tube, to obtain the same temperature as that in the attached thermometer, forbidden by Sir J. Herschell to be immersed in the cistern. Had due precautions been used, the results, I am satisfied, would have been all in favour of the Aneroid

The following were then tried at Parell Hill—first at the point where the road from the gardens crosses ; then in the turret at the base of the flagstaff. Barometer No. 4, which was left below, stood at 29·960 at a ¼ to 7 : the observations were all made betwixt this and half past seven.

	No. 2.	No. 3.	No. 5.
Barometer, lower...	29·940	29·920	29·916
Barometer, higher...	·840	·828	·830
Difference	·100	·092	086

Giving a difference of elevation of about ninety feet. The aneroids stood as follows, the instruments being arranged in the same way as before ;—

Road station...	29·885	29·850	29·910
Flagstaff...	·815	·740	·815
Difference...	·070	·110	·095

Giving a mean of ·092 nearly : a singularly close coincidence indeed,—the barometers in both

cases having got heated in the sun, and no time to allow the mercury to cool to the temperature of the attached thermometer. The following ratings made at the Observatory betwixt the great standard and an aneroid are still more satisfactory as being more full; I have taken no account of the difference betwixt the instruments, as they may be so adjusted as to work together, the daily range being the great test of delicacy :—

COMPARISON DURING THE MONTH OF APRIL AT THE OBSERVATORY BETWIXT THE STANDARD BAROMETER AND THE ANEROID.

	Barometer.			*Aneroid.*		
	Max.	Min.	Range.	Max.	Min.	Range.
April 1...	29·886	29·783	·103	29·920	29·830	·090
2...	·907	·818	·089	·970	·890	·080
3...	·933	·816	·117	·980	·890	·090
4...	·947	·787	·160	30·000	·840	·160
5...	·896	·782	·114	29·950	·840	·110
6...	·926	·755	·171	·980	·800	·180
7...	——	·782	——	——	·840	——
8...	·857	·756	·101	·910	·810	·100
9...	·826	·707	·119	·870	·740	·130
10...	·859	·753	·106	·880	·800	·080
11...	·884	·740	·144	·900	·790	·110
12...	·859	·728	·131	·880	·760	·120
13...	·867	·752	·115	·900	·810	·090
14 ..	——	·773	——	——	·800	——
15...	·861	·773	·088	·940	·800	·140
16...	·904	·779	·125	30·010	·900	·110
17...	·894	·780	·114	·010	·910	·100
18...	·883	·783	·100	·000	·910	·090
19...	·903	·795	·108	·020	·920	·100
20...	·895	·777	·118	·010	·910	·100
21...	——	·831	——	——	·880	——
22...	·928	·800	·128	·070	·940	·130
33...	·942	·768	·174	·080	·910	·170
24...	·907	·736	·171	·060	·900	·160
25...	·828	·688	·140	29·980	·850	·130
26...	·827	·679	·148	·980	·840	·140
27...	·820	·707	·113	·970	·890	·080
28...	——	·722	——	——	·900	——
29...	·849	·725	·124	.950	·850	·100
30...	·852	·741	·111	·970	·850	·120

This, it will be allowed, is wonderfully near—fully as much so as first-rate barometers at times approach to each other. I do not reckon these experiments at all conclusive, however: they require to be multiplied and extended in the face of the very strong theoretical difficulties which attach to the aneroid: though untried instruments may occasionally fail, those which have been once well tested in some such way as this, may be received with very considerable confidence. I lately watched the aneroid at sea as a marine barometer, and found it in no way inferior to the Torricellian Tube. The highly respectable and enterprising Firm of Treacher and Co., keeps on hand supplies of these and other instruments of good quality: they are a shade dearer than those sold by the Geographical Society,—the merchants of course taking commission, the Society charging none.

The Aneroid requires no correction of any sort: the only correction required for Adie's Barometers is that for temperature. What has just been stated is enough to illustrate the value of the aneroid, whose close coincidences with the barometer greatly exceed my expectations: I may, however, for the amusement of those who desire to go a little further into the matter, here venture on a few explanations or reductions. The Aneroid may be set anyhow with any barometer at starting, so the difference betwixt it and the mercury at any given point is matter of no consequence provided they agree in their movements. The correction for temperature of 86°, with a pressure above 29·5, is ·151; that for a temperature of 82°, with a pressure under 29·00, is ·136; and these numbers respectively require to be subtracted from the barometers at Balcairn and the survey station, reducing the means from 29·589 and 28·972 to 29·738 and 23 836,—and making the differ once betwixt the top and bottom instruments ·902. I find by the report of 1846, that the two observatory standards 48 and 50 often differ betwixt ·060 and ·070 from each other, or within little more than a hundredth part of what the aneroid and barometers differed in an observation

made hurriedly at twilight, approaching darkness preventing the care that was requisite from being bestowed.

The following is an extract from a letter from Captain Jacob Government Astronomer at Madras, and a very distinguished authority on these matters:—

"I have to thank you for the paper sent me the other day, containing your remarks on the Aneroid Barometer. I was rather surprised to observe the slighting manner in which you noticed it sometime back, and thought you would come round on further trial. I consider the Instrument a very excellent one *when well* made, and superior in almost every way to any *portable* Barometer I have yet seen; but there are a good many bad ones in the market, and I think among the number that have been brought to me for trial, I have found more defective ones *by* ——— than any other maker: whether this be accidental or not, I cannot say. Its advantages over the mercurial are not only smaller size and consequent greater portability, but also greater facility of reading off, greater delicacy of indication, less liability to get out of order, and greater facility of repair when injured, as it could scarcely suffer any injury but what might be repaired by an ordinary watch-maker or jeweller. In regard to the second point (greater delicacy,) most people would differ from me, but I have found a good instrument indicate *instantly* a difference of five feet when held in the hand, and running up a flight of steps, whereas I have rarely found a portable Mercurial Barometer that if reversed and put up again on the same spot would return to its former indication within ·005 even with much tapping. There is one mistake in your notice: you say the Aneroid requires no correction whatever. This indeed is what it *professes*, but it is a *false* profession with all that I have tried, as you may see by putting one of them in the sun for a few minutes. Each instrument requires its own correction for temperature, which can be easily ascertained in this very way: the correction is usually much smaller than that for the expansion of mercury."

The following extract is taken from the work entitled "Aide Memoire to the Military Sciences:—

"In the months of May and June, 1849, Major Robinson, R. E., undertook the task of verifying the use of the Aneroid at Portsmouth, and the height of Portsdown Hill was accurately measured by a good spirit level and some experiments tried, which at first were not favorable to the Aneroid, but on investigating the construction of the instrument it was found that each should have its own registor for indicating heights, from certain peculiarities in their mechanism. Major Robinson therefore taking one sold by Messrs Manual of Portsmouth to the dome of St. Thomas's Church, measuring exactly 100 feet, found that ·10 of an inch gave 95 feet, which was verified by going to the summit of a Tower at the Point measuring 75 feet in height. In measuring Portsdown hill with the same instrument, he found that 95 feet for every tenth of an inch, gave the height 337·6,—within two feet as measured by the Spirit Level. It would seem, therefore, to be necessary previous to measuring heights to ascertain practically what the height of 100 feet will be registered by the Aneroid; and as this check may be made as frequently as doubts arise by apparent discrepancies, in comparing one Aneroid with another, or comparing them with the mercurial Barometer, it is conceived that this instrument may be found desirable from its portability, and the simple mode of finding any height provided the altitude does not exceed 2000 feet."—*Aide Memoire to the Military Sciences.*

The following comparison of the ratings of the barometers with the Standard of the Royal Society of Edinburgh, was sent out with them by Mr Adie:—

No. 1.

Standard Barometer—corrected, R. S. Flint Standard.

1st.....29·935
29·948 No. 1.

·013—No. 1 + R. S. Flint Standard.

No. 2.

2nd.....29·935
29·950

·015 No. 2 + R. S. Flint Standard.

No. 4.

4th.....29·935
29·960

·025 No. 4 + R. S. Flint Standard.

No. 5.

5th.....29·935
29·940

·005 No. 5 + R. S. Flint Standard.

In compliance with the recommendation of Sir John Herschell, to lose no opportunity which presents itself of having barometers rated, I had those of Mr Adie read at the barostices every day they were in our possession, and as the maxima and minima of the Observatory are published in the newspapers, I was by this means able to obtain a series of approximate comparisons with their Standard. I was anxious, besides this, to obtain readings of all the barometers compared with each other for at least twenty-four consecutive hours, as the indications occasionally afforded by instruments of exactly the same construction, made by the same man, and read under exactly the same circumstances, are found differing often very materially from each other to an extent and in a manner most perplexing. An opportunity of performing an experiment of this sort had occurred while I had charge of the Observatory in 1843—the details are given in the Journal of the Bombay Branch of the Royal Asiatic Society, and are reprinted below. Five mountain and three marine barometers, four sympiesometers and three aneroids, were on the present occasion placed close beside each other in my office, about sixty feet above the level of the sea, and were read hourly for thirty-eight consecutive hours, from 4 A. M on the 14th May to 5 P. M. on the 15th. The results are subjoined: it has not been considered necessary to correct the barometer for temperature.

The observations from 10 A. M. to 6 P. M. on the 21st were made by myself, and may, I think, be fully depended on: the others were made by Mr J. Macfarlane and Sorabjee Muncherjee, and though the intelligence and care with which the task was performed by them is deserving of the utmost praise, I cannot help thinking that the remarkable irregularities exhibited at the barostices must be in some measure ascribed to the want of practice of the observers. Though the experiment is quite sufficient to obtain the ratings of the barometers, I am not prepared to extend its uses greatly beyond this. The standard at the Observatory, according to the newspaper returns, stood at its maximum and minimum on the 21st at 29·852 and 29·715,—this is corrected for temperature. The diagram at the end of the report will show the fluctuations at once.

The temperature throughout the day stood very unfortunately at 85°, and the correction of—·150 will suit for both maxima and minima. As the observatory standard is thirty-six feet, and our instruments were sixty, feet above the level of the sea, a further correction of +·023 will be requisite for comparison with the standard, or of —·122 if we include both corrections in one. There are two standards at the Observatory, and they differ on some occasions nearly ·070 from each other. I am uncertain which is quoted, but believe it to be No. 58 about to be referred to.

BAROMETRIC COMPARISONS *made at Bombay on the 14th and 15th May*, 1850.

Date and Hour.	Attached Ther.	Standard Mountain Barometers					Marine Barometers.			Sympiesometers.			M. Symptr.	Aneroids.		
		No. 1.	No. 2.	No. 3.	No. 4	No. 5.	No. 6.	No. 7.	No. 9.	2629	2690	2693	2668	1937	1942	3187
May 14—4 A. M.	84	29·954	29·974	29·919	29·920	29·899	29·855	29 860	29·864	29·790	29·880	29·900		29·860	29·860	29·865
5	84	948	967	900	931	930	850	870	861	780	860	890	29·540	870	870	875
6	84	895	878	883	925	890	870	885	874	720	900	940	500	880	880	885
7	83	924	926	908	938	920	885	895	885	840	910	830	510	895	895	905
8	84	928	950	950	974	936	900	915	900	790	880	850	540	920	920	925
9	85	962	952	936	974	960	905	920	912	920	920	945	540	920	920	925
10	85	955	947	930	976	940	905	920	910	920	950	940	530	920	920	925
11	85	945	955	925	966	944	901	910	900	915	940	923	525	923	923	925
12	85	930	930	910	946	938	895	895	884	891	910	910	510	915	915	910
1 P. M.	85	900	906	880	923	888	854	870	853	870	880	880	460	881	881	900
2	85	876	873	862	888	862	820	840	816	820	860	860	440	830	830	840
3	85	834	835	824	835	836	785	800	786	810	820	820	438	812	812	825
4	85	838	830	818	812	830	776	780	784	810	820	812	440	810	810	816
5	85	838	850	828	852	851	785	801	794	820	840	850	445	820	820	825
6	84	860	864	846	872	870	870	890	802	820	860	830	450	820	820	830
7	84	872	874	862	892	884	870	862	804	830	840	860	460	830	830	650
8	84	858	891	888	894	900	842	858	830	850	885	895	460	870	870	880
9	84	918	925	912	900	916	865	878	858	880	900	905	480	880	880	890
10	83½	958	978	946	961	901	888	900	880	900	930	940	520	910	910	915
11	84	946	948	956	989	974	842	906	842	900	920	940	530	904	904	915
12	83½	934	954	944	964	936	843	904	874	902	920	950	530	900	910	910
15—1 A. M.	83	946	926	924	962	942	840	880	876	900	900	920	510	905	905	910
2	83½	956	886	916	924	926	830	832	850	904	903	910	520	900	910	905
3	84	942	940	924	950	928	824	830	850	900	901	912	460	905	905	905
4	84	922	926	946	944	946	830	832	864	888	900	910	454	902	902	902
5	83	954	956	936	954	952	882	842	866	900	940	912	454	905	905	910
6	81½	926	914	890	920	916	875	885	876	905	930	940	520	920	900	905
7	82	950	942	908	938	940	892	900	887	940	950	950	530	930	920	920
8	82	956	956	946	980	952	912	915	904	950	980	980	550	950	950	930
9	82½	949	964	940	976	948	915	925	914	960	960	985	560	960	940	940
10	83½	958	964	944	980	956	915	925	914	950	980	980	550	940	940	940
11	84½	910	942	904	938	920	900	930	950	905	950	950	540	930	920	920
12	84	899	920	900	932	888	875	885	876	920	900	900	510	910	895	895
1 P. M.	85	924	916	846	932	912	830	830	852	860	880	880	530	880	881	880
2	85	914	884	866	892	874	820	822	832	840	860	860	454	854	852	850
3	85	882	864	852	882	872	760	820	808	820	840	840	440	850	850	840
4	85	880	852	832	852	844	750	750	810	800	860	820	420	830	830	830
5	85½	872	842	832	862	842	740	750	776	792	800	840	420	850	850	850

The observations already recorded were made in the end of May, when the mercury is low, but not in general subject to any remarkable fluctuations: those below made in June, at the stormiest period of our most stormy month. I trust on the arrival of our next supply of instruments to be able to renew the enquiry: it would be eminently desirable to know whether there are states of the weather or periods of the year when barometers differ more from each other than they do at other times and under different circumstances, or whether there be no discoverable law amongst their anomalies. To make the experiment satisfactory, the services of observers perfectly accustomed to such work is essential: those unused to it, however intelligent or anxious to do right, are not to be depended on. At Bombay, such are difficult to be had unless at regular establishments.

I may here be allowed to quote the experiment already referred to as made in 1843; the two together indicate the unwisdom of placing that absolute reliance on barometric observations, even with instruments of the greatest delicacy, which is sometimes placed on them. If it be impossible to get barometers of the very best construction and quality where the mercury is lowered half an inch or so each reading below its proper position and then restored to the fiducial point so as to get quit of all risks of adhesion, differ from each other when hung side by side more than ·030, or as much as would correspond to thirty feet of altitude, it is surely idle to speak of the coincidence of the barometer with the theodolite to within four or five feet as the result of more than an accident.

"The standard Barometer is a large one by Newman, (No. 58) the same as all the magnetic observatories are supplied with, with a tube of 530 diameter, requiring a correction of + 0·003 for capillarity. The scale is moveable, so that the correction for the rise of the mercury in the cistern is effected by bringing in contact with its surface the point of the rod to which the scale is attached. The barometer marked No. 8 is by Gilbert, and is the same in point of construction as those formerly supplied from the Government stores—the scale being of brass, the frame of wood. The Royal Society have stated, that no exact correction can be given for expansion in instruments of this form, which "no scientific observer would ever willingly use."* No account has been taken of it in the following remarks. The Barometers from No. 1 to No. 6 are uniform in point of construction. They were manufactured and brought to Bombay in 1843; the experiment under review having been made just after their arrival. No. 7 is by the same maker, and is of the same form nearly: it was brought to India early in 1840, and has since been occasionally employed in the Deccan as a mountain Barometer.

These instruments are all very beautiful in point of workmanship. They are fitted up with a brass frame, in which the attached Thermometer is sunk. The cisterns are of cast iron, with a glass plunger which can be screwed up so as to move the mercury to the top of the tube. The neutral point is marked on a short glass tube, enclosed in a cast iron sheath, ascending from the top of the cistern. The mercury is on each observation screwed up to this, which at once gives the correction for rise in the cistern and for capillarity. No correction for temperature has been made. The instruments were in this respect subject to nearly the same fluctuations of heat; the entire difference betwixt the attached Thermometers in no case amounting to two degrees Fahrenheit: this is equivalent to a difference in the Barometer of 0·005. If this be added, some of the minor discrepancies will altogether disappear.

The instruments were numbered arbitrarily, for the sake of distinction only, just before commencing observations. The mean of 48 readings of No. 4, is 29·699; that of No 7, 29·743; the difference between them is ·044. These are considerably the lowest and highest. Nos. 5 and 6 are perfectly coincident, and Nos. 1, 2, and 3, only differ ·004 and ·006 from each other respectively. The greatest of these very little exceeds the differences given betwixt some of the mountain Barometers provided for the Antarctic Expedition by the Royal Society's Standard; the least of them

* Report of the Committee on Physics and Meteorology &c. 1840. Though this instrument has been noted in the table, no account has been taken of it in the subsequent speculation.

are less then the disagreements betwixt the crown glass and flint glass Barometers of Somerset House.

The Sympiesometer which is noted in the table, is not here taken account of. It is a good instrument, by Adie, and has been in my possession since June 1840.

The following tables give the readings uncorrected. The standard is 36 feet above the mean level of the Sea; the other instruments 33 feet; there being no means of placing them exactly beside each other.

OBSERVED READINGS OF EIGHT BAROMETERS (HALF-HOURLY), FROM 4 A. M. 20TH JUNE to 3½ P. M. 21ST JUNE 1843.—Colaba Observatory, Long. 72° 49′ 53″ E., Lat. 18° 53′ 52″ N. Elevation above the sea, 36 feet.

B.M.T.		Standard.		No. 1.		No. 2.		No. 3.		No. 4.		No. 5.		No. 6.		No. 7.		No. 8.		Sympiesomr.	
		Bar.	Thr.	Bar.	Thr.	Bar.	Thr.	Bar.	Thr.	Bar.	Thr.	Bar.	Thr.	Bar.	Thr.	Bar.	Thr.	Bar.	Thr.	Symp.	Thr.
A.	M.		deg.		deg.		deg.		deg.		deg.		deg.		deg.		deg.		deg.		deg.
4	0	29·705	83·5	29·694	82·0	29·698	81·8	29·693	81·8	29·650	81·7	29·700	81·7	29·700	81·6	29·730	81·8	29·684	81·5	29·24	82·5
4	30	·715	83·2	·712	81·7	·720	81·5	·714	81·6	·656	81·5	·712	81·5	·716	81·5	·728	81·6	·690	81·3	·26	82·3
5	0	·715	83·1	·720	81·5	·720	81·5	·720	81·5	·690	81·5	·720	81·6	·716	81·5	·710	81·5	·712	81·1	·26	82·0
5	30	·725	82·8	·742	81·2	·760	81·0	·760	81·2	·736	81·2	·760	81·2	·760	81·2	·736	81·2	·720	81·0	·28	81·8
6	0	·739	82·4	·748	81·1	·762	80·0	·768	81·1	·746	81·1	·768	81·0	·772	81·0	·750	81·0	·732	81·0	·35	81·7
6	30	·751	82·3	·752	81·2	·768	81·2	·774	81·0	·750	81·0	·774	81·2	·780	81·2	·792	81·2	·742	81·0	·30	81·8
7	0	·755	82·2	·762	81·8	·770	81·9	·776	81·8	·754	81·9	·776	81·9	·784	82·0	·794	82·0	·746	81·8	·31	82·0
7	30	·757	82·7	·768	82·5	·778	82·5	·780	82·5	·760	82·4	·780	82·4	·796	82·5	·800	82·2	·750	82·1	·30	82·6
8	0	·759	83·2	·774	82·6	·780	82·7	·784	82·7	·766	82·7	·784	82·6	·794	82·7	·792	82·7	·755	82·8	·28	82·9
8	30	·765	83·7	·779	82·8	·784	82·9	·790	82·8	·770	82·8	·790	82·8	·798	82·8	·799	83·0	·770	83·0	·28	83·2
9	0	·771	84·6	·792	84·0	·780	84·0	·792	84·5	·774	84·2	·792	84·3	·799	84·4	·800	84·7	·774	84·0	·23	84·6
9	30	·757	85·2	·760	85·2	·770	84·8	·760	84·2	·756	84·9	·774	84·8	·776	84·8	·780	84·9	·760	85·0	·24	85·0
10	0	·747	85·7	·740	84·9	·744	84·8	·742	84·8	·709	84·7	·756	84·7	·750	84·8	·760	84·7	·750	85·4	·22	85·1
10	30	·715	86·0	·728	84·8	·739	84·5	·739	84·5	·700	84·5	·743	84·5	·744	85·0	·758	85·0	·746	85·3	·20	84·1
11	0	·735	86·2	·723	85·5	·736	85·3	·728	85·5	·690	85·4	·734	85·4	·736	85·6	·746	85·6	·740	86·0	·17	85·5
11	30	·735	86·6	·728	85·0	·738	84·8	·729	85·0	·693	84·8	·736	84·8	·736	85·2	·740	85·4	·737	86·0	·17	85·7
P.	M.																				
0	0	·727	86·5	·719	85·5	·725	85·0	·730	85·0	·690	85·2	·730	85·2	·729	85·7	·739	85·7	·730	86·2	·16	85·7
12	30	·712	87·0	·702	86·1	·705	85·8	·711	85·8	·665	86·0	·712	86·0	·711	86·3	·729	86·3	·719	86·8	·13	86·3
1	0	·699	87·3	·692	86·5	·700	86·3	·700	86·2	·648	86·3	·700	86·3	·700	86·5	·712	86·5	·718	87·0	·11	86·7
1	30	·700	87·6	·690	86·5	·700	86·3	·700	86·5	·693	86·3	·700	86·3	·704	86·5	·710	86·5	·706	87·1	·10	86·9
2	0	·695	87·8	·686	86·9	·691	86·7	·695	86·8	·679	86·5	·696	86·5	·691	86·9	·703	86·0	·702	86·5	·10	86·5
2	30	·685	87·5	·673	86·5	·678	86·3	·684	86·3	·671	86·2	·680	86·2	·681	86·5	·691	86·5	·690	86·2	·11	86·2
3	0	·686	87·2	·672	86·5	·680	86·3	·691	86·6	·673	86·2	·693	86·3	·694	86·5	·698	86·5	·692	86·2	·11	86·0
3	30	·677	87·2	·664	86·4	·670	86·1	·670	86·2	·636	86·1	·680	86·2	·676	86·5	·690	86·5	·685	86·0	·11	86·0

The Standard was found by this report to contain an air-bubble, and to be 00·125 too low.

OBSERVED READINGS OF EIGHT BAROMETERS (HALF-HOURLY), FROM 4 P. M. 20TH JUNE TO 4 A. M. 21ST JUNE, 1843.—Colaba Observatory, Long. 72° 49′ 53″ E., Lat. 18° 53′ 52″ N. Elevation above the sea, 36 feet.

B.M.T.		Standard.		No. 1.		No. 2.		No. 3.		No. 4.		No. 5.		No. 6.		No. 7.		No. 8.		Sympiesomr.	
		Bar.	Thr.	Bar.	Thr.	Bar.	Thr.	Bar.	Thr.	Bar.	Thr.	Bar.	Thr.	Bar.	Thr.	Bar.	Thr.	Bar.	Thr.	Symp.	Thr.
P.	M.		deg.		deg.		deg.		deg.		deg.		deg.		deg.		deg		deg.		deg.
4	0	29·671	87·1	29·658	85·1	29·660	85·0	29·669	85·0	29·656	84·3	29·670	85·9	29·670	85·3	29·620	85·1	29·680	85·9	29·11	85·8
4	30	·667	86·8	·650	84·9	·654	84·8	·660	84·8	·642	84·7	·662	84·8	·658	84·8	·672	84·9	·674	85·0	·13	85·4
5	0	·673	86·6	·656	84·5	·660	84·6	·662	84·5	·650	84·2	·664	84·3	·662	84·4	·678	84·5	·680	84·6	·14	84·6
5	30	·669	85·8	·652	84·1	·660	84·2	·654	84·1	·654	83·9	·660	84·0	·658	84·0	·670	83·9	·672	84·0	·12	84·1
6	0	·669	85·2	·650	83·7	·658	83·6	·650	83·5	·658	83·7	·660	83·6	·630	83·7	·672	83·6	·672	83·7	·12	84·3
6	30	·683	85·0	·656	83·5	·662	83·5	·668	83·4	·663	83·4	·672	83·5	·672	83·5	·690	83·4	·686	83·5	·14	84·2
7	0	·695	84·9	·690	83·4	·692	83·4	·690	83·4	·636	83·3	·693	83·4	·700	83·5	·712	83·4	·708	83·4	·16	84·2
7	30	·699	84·1	·706	83·4	·704	83·4	·700	83·3	·710	83·3	·714	83·4	·716	83·3	·730	83·3	·720	83·4	·18	84·1
8	0	·703	84·2	·712	83·0	·698	82·9	·694	83·0	·708	83·0	·693	83·0	·724	83·3	·723	83·5	·704	83·8	·20	83·8
8	30	·708	84·0	·700	82·3	·700	82·4	·700	82·5	·692	82·5	·710	82·5	·710	83·3	·717	82·5	·708	82·9	·22	83·3
9	0	·715	83·2	·709	81·9	·706	81·9	·718	81·9	·700	82·0	·728	82·5	·720	83·7	·732	81·9	·704	82·9	·24	82·7
9	30	·734	83·0	·723	81·5	·720	81·5	·730	81·5	·718	81·7	·744	81·7	·735	82·9	·750	81·5	·735	82·0	·27	82·3
10	0	·737	83·0	·732	81·8	·730	81·5	·740	81·5	·721	81·8	·742	82·0	·744	82·0	·754	81·5	·735	81·8	·29	82·2
10	30	·725	82·7	·720	81·5	·723	81·5	·726	81·6	·722	82·2	·740	82·5	·732	82·3	·754	81·5	·730	81·9	·26	82·2
11	0	·727	82·7	·722	81·2	·726	81·4	·723	81·5	·726	82·4	·742	82·5	·736	82·8	·770	81·9	·738	81·8	·26	82·4
11	30	·725	82·8	·730	81·6	·736	81·8	·736	81·9	·736	82·4	·746	82·4	·740	82·7	·776	82·0	·742	82·0	·27	82·7
A.	M.																				
0	0	·718	83·0	·724	82·4	·724	82·3	·722	82·3	·726	82·5	·728	82·7	·726	82·8	·760	82·5	·732	82·4	·24	83·2
12	30	·701	83·0	·700	82·4	·710	82·4	·700	82·4	·700	82·6	·712	82·6	·704	82·7	·740	82·5	·722	82·2	·23	83·4
1	0	·685	83·1	·690	82·2	·688	82·2	·690	82·2	·696	82·4	·686	82·4	·684	82·5	·700	82·2	·700	82·1	·20	83·0
1	30	·675	83·0	·670	82·5	·660	82·4	·675	82·4	·668	82·5	·680	82·6	·680	82·5	·700	82·3	·690	82·1	·20	83·0
2	0	·687	83·0	·678	82·0	·667	82·0	·670	82·2	·658	82·5	·688	82·5	·689	82·5	·698	82·5	·683	82·2	·20	82·7
2	30	·680	83·0	·670	82·0	·672	82·0	·672	82·0	·658	82·3	·682	82·3	·670	82·3	·690	82·9	·688	82·0	·20	82·7
3	0	·673	82·9	·664	82·0	·668	81·9	·672	82·2	·660	82·3	·680	82·2	·670	82·2	·688	81·9	·680	82·0	·20	82·4
3	30	·675	82·7	·660	81·5	·660	81·5	·668	81·5	·660	82·0	·680	82·0	·676	82·0	·700	81·6	·690	81·8	·21	82·2
4	0	·675	82·8	·676	81·8	·676	81·5	·674	81·6	·660	81·9	·678	81·7	·674	81·9	·702	81·5	·682	82·8	·22	82·1
Means.		29·711	84·5	29·706	83·3	29·710	83·2	29·712	83·2	29·699	83·3	29·715	83·4	29·718	83·5	29·743	83·1				

The Standard was found by this report to contain an air-bulb, and to be 00·125 too low.

Dismissing No. 7, whose sluggish movements render it liable to suspicion, the mean height of the whole of the others may be assumed as nearly the proper elevation of the mercury for the day; this was 29·710.

In comparing the altitudes of the Barometers at 4 o'clock on the morning of the 20th, which may be assumed as the minimum, or nearly so,—No. 7, continuing to descend till 5, with the maximum obtained by all the Instruments, save No. 2, exactly at 9 o'clock, we shall have the following result. In reality the comparison ought to have been with the maximum of 10 p. m. of the 19th, but of this we have no readings.

	A. M.	1	2	3	4	5	6	7
Maximum diff. 051	9 A. M.	29.780	29.780	29.792	29.774	29.792	29.799	29.800
Mean range. 097	4	.691	.698	.698	.650	.700	.700	.730
Interval 5 hours	... ... diff	.088	.082	.094	.124	.092	.099	.070

The following is the difference betwixt the same hour of maximum and the afternoon minimum of the 20th, which follows at 5 P. M., at an interval of 8 hours.

	A. M.	1	2	3	4	5	6	7
Maximum diff. 035	9.	29.780	29.780	29.792	29.774	29.792	29.799	29.800
Mean range 122	5 P. M.	.656	.660	.662	.650	.664	.662	.678
	... ... diff	.124	.120	.130	.124	.128	.137	.102

The following is the range betwixt half past 11 P. M. on the 20th and half past 3 A. M. on the 21st.

	1	2	3	4	5	6	7
P. M. 11½	29.730	29.736	29.736	29.736	29.746	29.740	29.776
A. M. 3½	.660	.660	.668	.660	.680	.676	.700
... ...	.070	.076	.068	.076	.066	.061	.076

Maximum diff. .010=mean range 71.

But on this occasion the Instruments attained the maximum and minimum irregularly, in point of time, for example.

	1	2	3	4	5	6	7
10 P. M.	11½	10	11½	11½	11½	11½	
? 732	736	740	736	746	740	776	
660	660	668	660	678	674	700	
	½ p. 3	½ p. 3	½ p. 3	½ p. 3	4.	4.	½ p. 3
	.072	.076	.078	.076	.068	.066	.076

Maximum diff .010=Mean range ·070.

Five Instruments attained their maximum at ½ past 11, and two at 10 o'clock,—they had all fallen during a shower at ½ past 10; and though they all rose again, No. 1 & 3 did not attain the altitude they had reached at the earlier hour: so, in like manner, the morning minimum was disturbed by a shower a little before two and again before four, which deranged the hour of minimum of No. 5 and 6, whose lowest point was at 4 o'clock. With the correction of ·125 here applied to the standard, which exhibits, notwithstanding its disorganization, much the fewest anomalies, it gives very nearly the true range after all. The morning hour of minimum noted on the separate record of the Observatory was 3 A. M. on the 20th, and half past 3 on the 21st, as shewn by the standard Barometer, the morning maximum being 9 A. M., that of the evening half past 11.—The afternoon minimum hour is half past 4. This gives an interval of nearly six hours betwixt the morning minimum and maximum; of seven and a half betwixt the latter and the minimum of afternoon; of seven betwixt this again and the night maximum, and of no more than four betwixt the last and the morning maximum. This, of course, strictly refers to the day in question, and to that only, though it will probably be found to be near that for the month of June on an average of years.

The mean amount of the ascending range betwixt 4 A. M. and 9 A. M. on the 20th is .097, the maximum .124, the minimum .070; both these are suspicious,—the former is the reading of a playful and vivacious instrument, No. 3, which seldom keeps with its brethren, the latter of a high set but very dull sluggish one, which generally falls behind in all movements whether in ascent or descent; the maximum difference amongst the seven amounts to .054.

The mean amount of descent, betwixt 9 A. M. and half past 4. P. M. on the 20th, is .122, the maximum 137, the minimum 102,—this again by No 7, the greatest difference betwixt any two, is .035.

The morning descent from half past 11 P. M. on the 20th, to half past 3 on the 21st, is betwixt 70 or 71, according as the Instruments are taken by a fixed hour, or by the points of maximum and minimum attained at different hours.

This experiment I expect to be again able to repeat with a still larger collection of Instruments after the cold weather sets in; it is tedious and troublesome, and worthless, unless the Instruments be of nearly uniform make and of extreme accuracy. This, on the present occasion, was in all respects the case."

A severe and long-continued sickness from which I suffered from September to February, has somewhat retarded researches in Physical Geography, to which the Society, in conformity with its original objects, had some time since devoted itself :* the information supplied by the publication of the Report of the Ob-

* As the present researches of the Society appear by some of its members to be considered an innovation not contemplated by its originators, I subjoin the following extract from the report of the Committee for making arrangements for carrying out the views of the Society, laid before the meeting for June 1833 :—

"The establishment of an institution, the only one in this place, devoted to physical science, was thought a favorable opportunity for setting on foot what has been long a desideratum in Bombay—a Meteorological Observatory. The phenomena of climate, so closely connected with the physical features of every country, and presenting such interesting peculiarities in this, cannot but be an object of interesting study to a Society formed for promoting Geographical knowledge. The fact that the climatology of Asia generally at this moment engages the researches of the most eminent natural philosophers in Europe, is an additional inducement to direct more attention to the subject than has hitherto been paid on this side of India; and from the interesting geographical position of this Island, the history of its climate, if carefully registered, and documents regarding it worthy of confidence transmitted to Europe, must be received with great interest by those engaged in the above researches. If the Society could induce gentlemen at outstations to follow the example held out at the presidency, it would confer a very important benefit on the science of climatology.

"To avoid delay in commencing these observations, a few instruments were procured here, through the permission of Government, from the Medical Stores ; and the sum of rupees four hundred (Rs. 400) were voted to be remitted to England for the purchase of others of nicer workmanship and greater accuracy. These have been carefully constructed, expressly for the Society, under the superintendence of a scientific gentleman in London, who has kindly undertaken this charge at the request of the Secretary. The instruments may be expected by the first arrivals.

"In concluding this Report, the Committee, as it has alluded to one cause of the slow progress which the Society has made, cannot omit to mention another which has tended powerfully to produce the same effect, viz , the apathy and indifference with which the Society has been looked upon by the greater proportion of its Members. Many have felt disappointed at the little advancement which has been made, forgetting the many difficulties which an association devoted to the sciences of observation has to contend with when compared to those which present themselves to a Society having purely a literary object. The sedentary contributors to the latter may, at will, draw from the stores of their imagination or previously acquired knowledge communications of the most interesting nature, and with a rapidity proportioned to their zeal for the progress of their institution. But we must patiently wait the result of the labours of the Traveller and Navigator, participating in their arduous progress, their delays and difficulties ; and by endeavouring, by every means we possess, to infuse into them, and encourage, a taste for the objects of our Institution, we must excite an honorable ambition to employ their opportunities for the promotion and advancement of whatever is most useful to science, or beneficial to mankind. But it has been shewn that something has been done towards fulfilling the objects for which the Society was instituted ; and when it is considered that this is the work of two or three individuals only, we may surely look for more important results when a larger proportion of members shall be induced to take a more active interest in the advancement of the institution. As the establishment of this Society has been noticed in the public prints, both of India and Europe, and the most honorable mention of it is made by those of the latter, we have gone too far to think of abandoning a project which has not yet had the benefit of a fair trial, but must, by bestowing a more active interest on its concerns, attempt to overcome the difficulties which every institution has to encounter until it is firmly established.

"The Meteorological Instruments which the Society had ordered from England, which have since been received, are, 2 Barometers, 1 Leslie's Hygrometer (on account of Leslie's death his instruments could not be procured), 2 Register Thermometers, 1 Dipping Needle, 1 Thermometer as Hygrometer, 1 ditto as Æthroscope, 1 do. as Photometer.—Proposed, that, on the safe arrival of the above, a further remittance of four hundred rupees shall be made for the purchase of Geographical Instruments, a list of which shall be made out and submitted to the Society at the next meeting."

servatory for 1846 now for the first time enables me to draw up from the commencement a continuous report on the matter. The subject was first brought before the Society in 1844,* when a suspension of surveys and a general want of Geographical papers threatened to leave us without matter for our *Transactions*, and our late worthy President, Captain Ross, at one time proposed to me that the Society should on this ground be dissolved. To prevent delay I ordered out instruments at my own expence when the scheme was first in contemplation, that this difficulty might at once be surmounted. Early in 1845 it was brought under the notice of Government, and before any answer had been received on the subject I had left for England, where the matter was brought under the notice of the Admiralty, and so thoroughly approved of by them that a grant of £350 was at once made for the purchase of instruments. In February 1846 the Society, on having the whole of the papers on the subject placed before them, approved and confirmed my proceedings while in England, embracing the entire arrangement of the scheme, and pledging themselves to carry out to the fullest extent practicable the objects in contemplation.† On resuming correspondence on the subject, it appeared that our scheme had somehow unknown to us become altogether estranged from us, and such arrangements made as I felt confident—and my convictions have been fully realized by the fact—would entirely frustrate the ends the Society and Government had equally in view. Government, in part apparently misapprehending our views on a matter in which they expressed themselves so willing to assist, and had already so assiduously assisted, placed the matter in the hands of the ordinary executive—the Military Board; the Board, in conformity with the customs of the office, devolved it on the officer in charge of the Observatory, Professor Orlebar. Mr Mayes, as appears from the Observatory Report, proceeded for Aden in February 1846: one of the Tide Gauges I had provided for the Society was purchased for his use—another had been sent beforehand in charge of the Engineer on the spot. The Tide Gauge had not been fitted up at Bombay, though Captain Haines had given warning of the difficulty of getting it fitted on the spot.‡ The Gauge was not in

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* *Bombay Geographical Transactions*, 1844-46, page vii.

† *Bombay Geographical Transactions*, 1844-46, page xxxvii:—
Resolved.—That the Society approve and confirm Dr Buist's proceedings, as detailed in the papers submitted to this Meeting, and at the same time pledge itself to carry out to the fullest extent practicable the scientific and useful objects therein contemplated.

‡ See letter to the Military Board on the subject, with Captain Elder's reply.—Geographical Transactions, Vol. VII. 1844-46, pp. xli-xlii:—
"Captain Haines fortunately is in possession of a barometer of similar form, and by the same maker: this will serve perfectly till other instruments arrive.
"Two tide-gauges by the same maker, and nearly of the same form, as those expected, have been provided for Aden; but Captain Haines, in conversing on this subject with myself some three week since, having urged the importance of having all the instruments as complete and serviceable as possible before being sent to him, I would respectfully recommend that both gauges be furnished with boxes to cover them from the weather, as it is not intended to place them under other cover, and pipes to supply the place of wells. These require to be made of wood and partly lined with copper. I have forwarded drawings of them on a separate sheet, and shall be happy to superintend their construction, should the Military Board desire it. Accompanying is a woodcut engraving of the gauge.
"In addition to the instruments, the observers require to be furnished with forms, ruled schedules, and minute and definite instructions for the transmission of returns; all of which, if desired, will be provided by the Society—Government defraying the expence.
"I may, perhaps, be permitted to add, that the scheme which has thus been commenced is looked on with much interest by men of science at home; and H. M.'s Admiralty, with whom I was in very close intercourse before leaving home, as well as the leading members of the Royal Society, look with high satisfaction on the promptitude and alacrity with which all scientific investigations are taken up in India."—Extract of a letter, dated 22nd Jan. 1846, from Secretary Geographical Society to the Military Board.
"Sir,—With reference to your letter No. 1, dated 22d ultimo, regarding Tidal and Meteorological instruments for employment at Aden, I have the honor to inform you, by direction of the Military Board, that Professor Orlebar has already undertaken, and the Board have com-

consequence in use till December, and Mr Mayes having received no instructions as to the number of curves to be traced on each sheet, his earlier observations are confused. The other instruments supplied him were a Mountain Barometer by Adie—this had been rated at the Observatory, but Mr Mayes was not provided with a note of the ratings, and a copy was declined us when applied for; a Self-Registering Wind and Rain Gauge, with a set of Thermometers. A second wind and rain-gauge which had been procured for Kurrachee, where no one could be found to take charge of it, was sometime afterwards sent to Aden and set up on the summit of Shum-Shum, where it has since been employed. He was also provided with the Theodolite belonging to a small Declination Magnetometer, and with this he took the angular observations of the high lands around: the magnetic part of the apparatus was promised to have been sent after him.* Mr Mayes was provided with Schedules from the Observatory, but had no written instructions of any sort; and though frequent application on this subject was made by him to the Observatory, no answer was ever received by him, and for some months he was in ignorance who was his superintendent. The observations made by him from April to December 1846 are, as already stated, printed unreduced at the close of the report of the Observatory: they are wholly useless for the purposes of the Meteorologist, but may be made serviceable by being re-arranged, reduced, and reprinted. Mr Mayes was not at this time furnished with a copy of the Royal Society's Tables, and one set of barometric readings which was reduced was so by a formula—the reductions differing from those of the tables. They are printed in both cases rough as received. Mr Mayes was placed under charge of the Society from January 1848, and has since then been provided with everything desired by him: he has himself reduced all his barometric observations, and prepared them for the press. In 1849 he was, in addition to his other duties, engaged in making a comparison betwixt the range of the barometer on the top of Shum Shum, 1800 feet above the level of the sea, with that on Seerah Island, 180 feet high: the results are now in the printer's hands.

If from these statements it should appear that the work of the year has gone for little, the circumstances under which we have been placed must be kept in view. In December, 1848, Government intimated its willingness to place certain instruments in their possession at our disposal: it was not till the 6th April 1849 that the instruments in question could be made available, and until that was the case, the Society could take no steps to provide themselves elsewhere, as they were ignorant of what Government possessed.† The instruments proved

mitted to him, the superintendence, under their control, of the measures now being adopted for prosecuting Tidal and Meteorological Observations; and that Professor Orlebar has already procured the Tide-gauges and Barometers (*a*) requisite, and has ordered Thermometers and some other instruments from England.

"2. I am also directed to inform you, that the necessary forms in which to register Observations are now being Lithographed."—Extract from letter, dated 12th Feb. 1846, in answer to the foregoing.

(*a*) The tide-gauges and barometers here referred to were those recommended in the preceding letter, and which had been purchased subsequent to the 22nd January and anteriorly to the 12th February! They were forwarded to Aden without having been fitted up as recommended!.,*Secy B. G. S.*

* Mr Mayes's letter to the Society.

† *Bombay Geographical Transactions*, 1848-49, page lv.—

3.—"That the Society accept the offer of Government to furnish them with Instruments for the Tidal and Meteorological Observatories at Kurrachee and Viziadroog: and that they recommend the two Tide-Gauges lately offered the Society to be purchased for two other of the Observatories in contemplation, under the reservation mentioned by Government."

"Government had on the 18th of November written to the Society, in reply to theirs of 1st September, intimating that they could immediately provide instruments such as were required,—offering them the use of two tide-gauges; and that this had been immediately replied to, accepting the tide-gauges on the terms on which they had been offered. Two months and a half had expired betwixt receipt of this and the dispatch of that to which it was an answer, and two months more had now elapsed, and they had heard no more on the subject, so that at this rate they might look for the next reply to the letter proposed to be written some months hence. Either of the Society's previous letters might have been answered in an hour's time. The Secretary was directed to address Government at once on both points, so as to come to an understanding on the subject."—*Ibid*, page lxvii.

to be a Tide-Gauge, purchased from me in February 1846 for service at Kurrachee, a pair of Thermometers, with a large Self-Registering Tide-Gauge by Bunt, and Wind and Rain-Gauge by Newman, on the pattern of Ostler. The latter two were sent in so minutely dissected, that scarcely a pin or screw was left in its place, and unless by the assistance of a good mechanic they could not have been put together. By correspondence which since has come into the possession of the Society, it appears that these instruments had belonged to the Madras Govt.: they had up to the end of 1844 been employed at Cochin under charge of Mr Taylor, Company's astronomer: they were in January 1845 forwarded to Bombay, and desired to be set up at some station in the Gulf of Cutch; and they had from this date till April 1849 lain unemployed.* The Tide-Gauge was at the time reported on as being too cumbersome for transmission to an outstation, as the structure required by it would cost more than a lesser gauge, house and all. The instrument is a very beautiful one,—the clock portion of it a fine dead beat, which would well serve the ends of a time-piece anywhere. It might easily be exchanged for the small-sized light Tide-Gauge now in use at Colaba, —the latter being employed for outstation duty,—or it would be valuable for tidal observation, as well as for clock purposes, at the end of the Apollo

* The following letter from the Madras Government in 1845 intimated the despatch of the instruments to Bombay :—

No. 53.—Marine Department.

To the Secretary to Government, at Bombay.

Sir,—With reference to my letter No. 404, dated 30th December last, I am directed by the Most Noble the Governor in Council, to forward Copy of one from the Acting Secretary to the Marine Board, reporting the transmission of the Instruments therein alluded to, for the Tidal Station in the Gulph of Cutch, together with the original receipt which accompanied it, and to state that the sum of (25) twenty-five rupees paid by the Collector of Malabar on account of Freight will be debited to the Bombay Government.—I have the honor to be, &c.,

Fort St. George, 22nd Feb., 1845. (Signed) J. F. Thomas, Chief Secretary.

The following list, accompanying the instruments from the Colaba Observatory, indicates the state of dissection in which they were on reaching the hands of the Society in 1849 :—

Tide-gauge by Low, Dundee, in good order :—Tide-gauge, a wooden frame, one wooden cylinder, one clock with lower part of the pendulum ketch broken, one brass gauge; one traverse guage, one brass wheel copper-wire, one brass axle, one brass mortised conical wheel, four brass gudgeons, one wooden waster, one hexagonal brass nut, one brass thumb screw, four screws and wasters for clock, four iron screws, two mill head screws, two common brass screws, one extra weight, one float attached to a copper wire, all in good order; one spirit self-registering thermometer, one mercurial ditto ditto.—Wind-gauge :—one table, one clock with the clock-chain, two weights, large and small, and pendulum complete; two pannels, one clock-board, one copper plate two feet by one, one compass card, with index and stand, one leather string with clasp, three brass sockets, one axle with two wheels on ends, two brass stands, one rack, two brass pencil-holders, one tube with slits at the ends, three wheels, two screws, two milled head screws, two milled head nuts, one small brass axle with washer, five brass pins, three iron screws with short heads, four old iron screws, two thumb screws, one small brass screw, four small weights, one small glass tube, four brass rollers, two watch chains, (copper) one small watch swivel, twenty large and ten small screws, one pencil-holder, thirty-seven small screws, two small milled head screws, one small cap, two small nippers, one small milled head screw, one small brass hook, two brass pins, five brass T stands, three brass plates, two brass curves, two brass wheels, two small brass Ts, one small brass plate with the screw-holes, one brass pencil-holder, one rain-gauge, glass and globe, with the pipe complete. The copper pot with three chains, and a wire complete, two zinc pilliasters, two curved piras, one brass collar and chain complete, one brass and one zinc ring, two small brass wheels, two brass clips, one brass T stand, fifteen brass screws, four iron screws and nuts, one octangonal iron nut, one small copper cylinder, one segment beam with axle, one pressure tube and a screw complete, one iron band and a brass pully, one tin funnel covered with tar, one brass piece with gurding wheel and an iron connecting screw in, three copper tubes, one having a hand close to the middle as long as the box, one tube eight feet long, one ditto six feet, one four feet long, with a pinching screw at the end, one bent tube five feet long, one rain-funnel (copper,) one vane with ornamental top, one large conical copper tube with a pipe inside, with collar for three stags, the bent copper tube six feet; three copper stags, three cases and covers; all the above in good order.

9th April, 1849. J. H. Dunn.

Pier, or on any conspicuous place at the Dockyard bunder. It is a pity such an instrument should remain useless. The monsoon had arrived before the instruments could be fitted up with houses, and got ready for dispatch, and since September I have been in a great measure off duty. The Wind and Rain Gauge was sent to Major Jacob at Sawunt Warree, but found too cumbrous for any building at his disposal: it was then offered to Mr Dalzell at Vingorla, who found its size inconvenient, and it is now on its way to the presidency to await the determination of Government or of the Society.*

The Society never contemplated the use of instruments so ponderous, expensive, and burthensome to set up, as those of Ostler, of which two will be returned from Aden so soon as Mr Mayes is recalled, in addition to that now referred to; and it would be a pity, now that we possess them, that they should not be employed. I beg respectfully to recommend to the Society that they suggest to Government that that now on hand be sent to Ahmednuggur, to be placed under charge of Captain Gaisford of the artillery, well known as a man of science, and already recommended to us through Government as an observer. It will here afford a record of the rains and winds 200 miles beyond the ghauts, and which ought to be of interest, while the other apparatus of an observatory committed to the charge of the artillery officer at the station, might secure us, where European sentries are at all times on duty, an invaluable series of hourly observations. We have never yet learnt how the two Aden wind-gauges were come by: one of these might probably be stationed at Poona, the other at the Mahabuleshwar Hills or on the top of Singhur, where I have no doubt the officer of the 10th Hussars whose bungalow might seem best suited for its reception, would see to its erection. It is an object of much interest to know at what rate the fall of rain decreases or encreases as we advance into the interior or ascend to considerable elevations,—as also to determine at what hour the wind changes, and in what direction it passes in its change, under these circumstances as compared to the coast: and perhaps the summit of Neat's Tongue close beside us, an elevated mountain one thousand feet high, might be considered a not undesirable site. A house of frame-work would suffice for the instrument, and an intelligent native could probably be got to watch over it for Rs. 8 or Rs. 10 a month. Whatever may be thought of these recommendations, it will, I imagine, be agreed that on no account should expensive instruments such as those on hand be allowed to lie idle when they can be employed.

The observations, with the exception of the Aden Tide and Wind Curves, are all now in the printer's hands, but it would, I think, be well to issue the next number of our Transactions, now nearly ready for publication, without them. We were a year ago assured by the Secretary to the Byculla Schools, that the Colaba Observations for 1847-48 would be through the press by February 1850,—and they may now, it is hoped, very shortly be looked for. On reading a paper on the results of these researches at Bombay, Mr Orlebar stated before the British Association in 1847 that "arrangements had been made so that the observations of each year should be in the hands of the printer at the close of that year, and be ready for issue at the end of next. Thus all the observations would be available at a very early date for the use of meteorologists and magnetists. At the end of each volume it was intended to append whatever reductions the superintendent may have been able to accomplish without impeding the issue of the observations themselves." The plan here proposed seems an excellent one: it does not appear to have been carried out. It is now near the middle of the year 1850, and we have as yet not seen anything of the observations for 1847, and have been assured by Government that to allow us to make extracts or inspect proofs would impede publication! The officer in charge of the Observatory has, by direction of Government, furnished us the means and extremes,

* See report of the Committee on Physical Research.

with certain of the crisis periods, for 1849. For 1850 all these are being published in the newspapers, so that by waiting a little we may make our collection complete, and thenceforth we shall have no difficulty in our way. That science might suffer as little as possible from tardiness in publication, the Society has given permission to have extracts, proofs, or transcripts from unprinted papers, forwarded to any one desiring them engaged in pursuits kindred to its own: this occasions little or no trouble or inconveniency, and the benefit it confers is occasionally very great. We have already received most ample acknowledgments for assistance of this sort from one of our most distinguished fellow-labourers, Colonel Sykes, now preparing for the Royal Society a paper on Indian Meteorology, which, from the extracts I have seen, promises to be of the very highest interest and value. Delay, dangerous everywhere, is doubly dangerous in India, and it is much to be lamented, where so little aid and co-operation can under the most favourable circumstances be looked for, that any causes of retardation or interruption which can be avoided should be thrown in the way of research.

The Society, considering three years' observations at Aden sufficient, and trusting that the general scheme to be worked out by the various Civil Surgeons would from henceforth suffice, addressed Government, in November 1849, on the subject of the removal of Mr Mayes from Aden, suggesting that he should be sent to establish an Observatory at Suez, afterwards in the Persian Gulf or at Zanzibar. No reply to this has been received; the matter having been, I believe, referred to our Consul in Egypt: and meanwhile Mr Mayes continues to perform his duties with his usual zeal at Aden, ably aided and seconded in all things by Captain Haines. As already stated, he has for some time past been conducting observations in magnetism as well as meteorology,—his only magnetic instrument however being a dipping circle.

I have not as yet been able to have the tracings of the self-registering tide or wind-gauges written off or reduced, and so large a mass of these has accumulated that I should recommend them to be placed in the hands of some one possessed of sufficient leisure and competent to undertake their reduction. Should Mr Mayes be recalled from Aden he might very advantageously be employed in this, or the services of some of my former assistants at the observatory—one of whom I have had frequent occasion to employ in such matters—might be secured for the work, which he would, I have no doubt, perform satisfactorily. No time should be lost in this—the Aden report cannot be completed until a register of the wind at all events shall have been prepared.

KURRACHEE.—We have unfortunately been deprived of the most valuable services of Mr Leech at Kurrachee, by the removal of H. M.'s 22nd, but I have no doubt in some other quarter or capacity the zeal displayed by him while under our charge will be made available to science. The instruments supplied Mr Leach have been made over to the Civil Surgeon, Dr Allender, and we shall not for the present most probably be able to establish a separate Meteorological Observatory in Scinde. The Tide Gauge is now under the charge of Captain Hopkins, under Captain Powell.* On a late visit to Kurrachee, I made such arrangements on both points as will, it is hoped, suffice.

H. M.'s 22nd foot is now at Dugshai in the Jullundhur Doab: a letter received from Mr Leach on the arrival of the corps at the station, intimated his willingness to resume his labours in the service of the Society provided he could be supplied with instruments. The Jullundhur belongs to the Bengal rather than the Bombay scheme of research,—the results of the former having however been assured me by the Governor-General. It may be as well here to quote the remarks made on a

* Captain Powell has returned home since this was written. Captain Ethersey is now Superintendent of the Indus Flotilla.

former occasion before the Society in reference to Mr Leach's exertions at Kurrachee: on his leaving, I undertook to move the Society to apply to Government for an allowance to him similar in amount to that recommended to be given to a purvoe proposed to be allowed the observatory at Minora Point—Rs. 40 per mensem,—and now beg to recommend that Government be addressed on the subject; Mr Leach was four months in our employment:—

"Attention was specially directed to the exertions of Mr Leach at Kurrachee. Mr Leach had been provided with instruments late in April: at first there was no objection to his using them, when the commanding officer had stated on the matter being fully explained, that he saw no reason why a soldier should not amuse himself with barometers or thermometers as well as with long-bowls or racket, if it did not interfere with the discharge of his duty. Mr Leach (who had been an assistant to Mr Mayes in his meteorological labours at Aden) had instructed some of his comrades, so that the work might go on without interruption. He had commenced on the 1st of May, and he had on the 5th of June forwarded the following papers:—observations for every hour, taken for twenty-four hours on end, for the 1st, 8th, 15th, and 22nd; for every day of the month hourly from sunrise to sunset, and the barometer's turning-points (barostices) at ½ past 3 and ½ past 9 A. M., and 4 and 10 P. M. These barometrical readings had been entered as taken, then corrected for temperature &c., and filled in in schedules provided by the Society, so as to be at once fit for the printer's hands; while neatly drawn up diagrams accompanied them, which furnished a key in a moment to the tables. Mr Mayes and Mr Leach furnished most eminent examples of zeal and industry,—yet it would in all likelihood be found that there was not an European corps in India in which there were not abundance of officers who with the good sense and good feeling of Major Smith, were at all times most anxious to find amusement or occupation for the men—the more intellectual and improving so much the better,—and abundance of soldiers most ready to undertake any researches of this sort that might be entrusted to them. It was in the conviction of this, that the scheme of the Society was originally started—they had never had the slightest hope of success save from amateur exertion, and in this they had unbounded faith."—Vide page ix.

A copy of this report would be forwarded to the Secretary to Government with the Governor-General, and attention directed to the previous passage, when the objects desired would most probably be sufficiently attained. The stations in the north-west provinces within reach of river carriage, would probably be more easily supplied with instruments from Bombay than Calcutta.

PORBUNDER.—Captain Ashburner has unfortunately been removed from Porebunder, and the instruments sent to that Station are in safe keeping, but not as yet in use. I am at a loss what suggestion should be made regarding them.

VINGORLA.—Mr Dalzell has kindly undertaken to take charge of our tidal observations at Vingorla: he has been provided with an instrument duly fitted up, as well as with written instructions, and a supply of schedules: as yet we have not received any returns from him. The Gauge has been set up by him, but he has of late been suffering from sickness. I have no doubt the work will be ably performed.

Major Le Grand Jacob has already favoured us with a large mass of Meteorological Observations from Sawunt Waree: his barometer being an indifferent one, that which for the past twelve months has been in charge of Captain Del'Hoste at Phoonda Ghaut has been desired to be forwarded to him, one year's observations at Phoonda Ghaut being sufficient.

I have already mentioned the valuable contributions we have received from the regular establishments of Trevandrum, Madras, Lucknow, and Calcutta. Amongst our amateur allies the most indefatigable has been Dr Ford of Hoshungabad,—one of the ablest, most assiduous, and accomplished, meteorologists of India,—and Mr Pye of Futteghur.

Since the Society began in 1846 specially to devote its exertions to its prosecution, the subject of Physical Geography has made prodigious progress in India. Mr Hodgson, long distinguished, while Resident at Nepaul, for his researches in Bhudism, has been engaged for years preparing an account of the Physical Geography of the Himalayahs.

Mr Hodgson's papers and reductions form the subject of a paper in the Transactions of the Bengal Asiatic Society, and need not be here further alluded to at present. He proposes extending them to Western India, and has applied to me for maps of Central and Western India, in which the great mountain spines and ribs which indicate our river sources and basin, and afford the leading characteristics of the features of the country, are well marked and defined. I fear that the means of complying in these respects with his wishes are not such as could be desired. Few things would in India be more desirable than that tasks such as that proposed to himself by Mr Hodgson should be undertaken for all the more prominent localities in India; and that accounts of the Natural History or Physical Geography of given districts should be drawn up from existing information or original researches, and made at the time as complete as circumstances permitted,—it being much more advisable to secure an important fragment without loss of time than to wait for that accuracy and elaboration so eminently desirable where it can be attained, but for which much delay is indispensable. There are probably few men amongst us who could venture on such a task as this exclusively from his own resources; but there is no reason why a man should, with the contributions of others strewed in such abundance around, not make a beginning. We stand much more in need of good abridgments and epitomes of existing information than of accounts of original investigations and discoveries, and to the bulk of readers nothing would be more valuable or new than a clear and succinct outline of all referring to any given locality which has been for many years in print. The zeal and industry with which the members of all the services have in the midst of numberless difficulties, and of laborious duties whose claims were paramount, laboured in extending the boundaries of knowledge, is beyond all praise,—and the stock of information on all subjects possessed by us in reference to all parts of India is immense, but then it is scattered through such a variety and diversity of works, that those only who have access to a first rate public library can refer to it. Large public libraries are only to be met with at the presidencies, where every man is overwhelmed with professional avocations: at outstations, where leisure for study can be commanded, books are not to be had. To say nothing of the hundreds of solid works written on India, by officers of the Company's service, we have papers of the utmost value scattered through the following publications, without our possessing any indication in which of them it is most probable we shall find information on any given subject. For Bengal we have the Asiatic Researches, the Gleanings of Science, and the Transactions of the Bengal Asiatic Society; and elsewhere extensive papers on subjects of general science are to be met with in the Agricultural Transactions, and in the Calcutta Review, and Calcutta Sporting Review. At Madras we have the Literary Journal; while a world of excellent information on all manner of subjects is to be met with scattered through the numerous volumes on medical topography published under the supervision of the Medical Board. At Bombay we have the Transactions of the Bombay Branch of the Royal Asiatic Society, the Transactions of the Geographical and Transactions of the Medical and Physical Societies. But now-a-days writers are very often found resorting to the wider field of fame London supplies, in preference to the local vehicles that were wont to content them, and we find papers accordingly on Indian matters profusely scattered through the Transactions of the Royal Society of London, the Royal Geographical, the Royal Asiatic, the Geological, the British Association, and so forth; while shorter papers of value occasionally appear in *Jameson's* and other provincial journals. Few districts afford more attractive or varied fields for such general dissertations as those referred to than that prevailing around us, and he who would afford us in moderate limits, a dissertation on the Geography of Western India, and so on by the shores of Scinde, along the Persian Gulf to the Red Sea and Suez, of the river systems and deltas, the upheavals of the shores, the depressions and recesses of the bays and estuaries, the fillings up of the basin of the sea by detritus—the change

of the levels of the land by earthquakes—the rock and mud formations now in progress,—the tides, currents, and evaporation, in our seas,—would confer a boon on natural history worthy of ambition.*

The following is an imperfect list of the Geological papers above referred to. For the sake of reference, the papers reprinted have been given as contained in the works in which they appear, whether as originals or copies.

Papers in the Madras Literary Journal.

VOL. IV.—*Notes on the Geology of the country between Madras and the Neilgherry Hills, via Bangalore and via Salem. By* P. M. BENZA, *Esq., M. D., of the Madras Medical establishment.* —*Page.* 1

On the Geological position and Association of the Laterite, or Iron Clay, formation of India; with a description of that Rock, as it is found at the Red Hills near Madras. By ROBERT COLE, *Esq., of the Madras Medical establishment.* - *Page.* 100

Memoir of the Geology of the Neilgherry and Koondah Mountains. By P. M. BENZA, *Esq, M. D. of the Madras establishment.*—*Page.* 241

On the Granite Formation, and direction of the Primary Mountain Chains, of Southern India. By Captain JAMES ALLARDYCE, *23rd Regiment Madras Light Infantry.*—*Page.* . 327

Sketches of the Meteorology, Geology, Agriculture, Botany, and Zoology, of the Southern Mahratta Country. By ALEXANDER TURNBULL CHRISTIE, *M. D.*—*Page.* . . 452

VOL. V.—*Notes, chiefly Geological, of a journey through the Northern Circars in the year* 1835. *By* P. M. BENZA, *Esq., M. D.*—*Page.* 43

Sketch of the Geology of the Bombay Islands. By ROBERT D. THOMPSON, *M. D.*—*Page.* 159

VOL. VI.—*On a portion of the Dukkun, East Indies. By Lieutenant-Colonel* W. H. SYKES, *F. R. S., F. G. S., F. L. S.*—*Page.* 344

A Statistical and Geological Memoir of the country from Punah to Kittor, south of the Krishna River. By JAMES BIRD, *Esq., M. R. A. S., F. B. G. S., of the Bombay Medical estabt.*—*Page.* 375

Notes on certain Mounds of a scoriaceous character found near Bellary. By ROBERT COLE, *Esq., Madras Medical establishment.*—*Page.* 130

VOL. VIII.—*Description of the Valley of Londur. By Lieut.* NEWBOLD.—*Page.* . . 128

Geological Society, Malcolmson on the Basaltic Districts of India:—*Page.* . . 200

On the Lateritic Formation. By JOHN CLARK, *Esq., M. D., Asst.-Surgeon H. M. 13th Dragoons.*—*Page.* 334

VOL. IX.—*Geology of Bangalore, and of some other portions of Mysore. By* JOHN CLERK, *Esq., M. D., Assistant Surgeon, 13th Light Dragoons.*—*Page.* 89

On the Crystalline Structure of the Trap Dykes in the Sienite of Amboor: with an enquiry into the causes to which this peculiarity of certain Ligneous Rocks is due. By RICHARD BAIRD SMITH, *Lieutenant, Madras Engineers.*—*Page.* 287

Journal of the Asiatic Society of Bengal.

1840.—VOL. IX., PART I.—*Journal of a trip through Kunawur, Hungrung, and Spiti, undertaken in the year* 1838, *under the patronage of the Asiatic Society of Bengal, for the purpose of determining the Geological formation of those districts. By* THOMAS HUTTON, *Lieutenant 37th Regiment N. I., Asst.-Surveyor to the Agra Division.*—*Page.* . . . 489 *and* 555

1841.—VOL. X., PART I.—*On the Mines and Mineral Resources of Northern Afghanistan. By Captain* DRUMMOND, *3rd Light Cavalry.*—*Page.* 74

Geological Report on the Valley of the Spiti, and of the Route from Kotghur. By Captain HUTTON, *37th Regiment N. I.*—*Page.* 198

On the Geology &c. &c. of Hunumkoondah, H. H. the Nizam's Territory. By Dr. WALKER, *Madras Army.*—*Page.* 471

1842.—VOL. XI. PART I.—*Memoranda on the Geology of Bundelcund and Jubbulpore. By Dr.* J. ADAM, *B. M. S.*—*Page.* 392

PART II.—*Notes, chiefly Geological, on the tracts between Bijapore to Bellary, and Bijapore. By Captain* NEWBOLD, *F. R. S., Madras Army.*—*Page.* 929

Notes, chiefly Geological, from Bijapore to Bellary via Kennighirri. By Captain NEWBOLD, *F. R. S., &c.*—*Page.* 941

1844.—VOL. XIII., PART. I.—*Geological Map of Captain* HERBERT'S *Himalaya Survey.* —*Page.* 171

PART II.—*Journal of Captain* HERBERT'S *Tour from Almorah in a N. W. W. and a S. W. direction, through parts of the province of Kemaon, British Gurhwal, chiefly in the centre of the Hills, vide No.* 66, *Indian Atlas.* (*Edited by* J. H. BALTON, *Esq., C. S.*)—*Page.* . . 731

Extracts from the late Dr. JOYSEY'S *Journals, when attached to the Trigonometrical Survey in Southern and Central India.*—*Page.* 853

The tracing out the currents of the air and ocean off our shores was one of the great objects the Society had in view when its scheme of connected littoral observations was planned in 1844; and had not the most untoward and unlooked-for hindrances occurred, it is possible that by this time considerable progress in these investigations would have been made. The late Captain Young had commenced mapping out the currents betwixt the shores of Africa and Hindostan from latitude 8° to 18° N. Lieutenant Taylor is at present, I believe, engaged in a similar task, and the talent and perseverance of this promising young officer leaves no doubt of the value of his labours. The Assistant Secretary of your Society, Mr Macfarlane, has made considerable progress in the construction of wind and current charts, founded on the information supplied by ships' logs and on the principle

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Geological Remarks during the march from Benares (old road) via Hazarecbaugh, Bankoora, and Burdwan, to Barrackpoor. By Dr. J. Row, *B. M. S.—Page.* . . . 862

Notes, chiefly Geological, across the Peninsula from Masulipatam to Goa, comprising remarks on the origin of the Regur and Laterite, occurrence of Manganese veins in the latter, and on certain traces of aqueous denudation on the surface of S. India By Capt. Newbold, *F. R. S.—Page.* 984

1845.—Vol. XIX., Part II.—*Note on a curious Sandstone formation at Tessaram, Zillah Shahabad. By Lieut.* W. S. Sherwill, *66th B. N. I.—Page.* 477

Notes, chiefly Geological, across the Peninsula of Southern India, from Madras (Lat. N. 13° 5′) to Goa, (Lat. N. 15° 30′) by the Baulpilly Pass and Ruins of Bijanuggur. By Captain Newbold.—*Page.* 497

Notes, chiefly Geological, across the Peninsula, from Mangalore, in Lat. N. 12° 49′, by the Bisly Pass, to Madras, in Lat. 13° 4′. By Captain Newbold. *Page.* 611

Account of certain Agate splinters found in the clay stratum bordering the River Nurbudda. By Captain Abbott.—*Page.* 756

Notes, chiefly Geological, across South India, from Pondicherry, Lat. W. 11° 56′, to Boypoor, in Lat. N. 11° 12′, through the great gap of Paulyhautcherry. By Capt. Newbold.—*Page.* 759

On the Assam Petroleum Beds, (in a letter to Major Jenkins, communicated by him.) By Captain P. T. Hannay.—*Page.* 817

Remarks on the occurrence of Granite in the Bed of the Nurbudda. By Captain J. Abbott. *Page.* 821

1846.—Vol. XX.—*Notes, chiefly Geological, on the coast of Coromandel. By Captain* Newbold.—*Page.* 201

Geological features of Zillah Behar, note on the. By W. S. Sherwill.—*Page.* . 55

Koompta on the Western coast (S. India) by the Devanneimi and Nundeleanama Passes, easterly to Lumbum, and thence southerly to Chittoor. Notes, chiefly Geological, from, comprising a notice of the Diamond and Lead Excavations of Butwapur. By Capt Newbold.—*Page.* 380

Scringapatam, by the Hegulla Pass, to Cannanore. Notes, chiefly Geological, from. By Captain Newbold.—*Page.* 315

Western coast of South India. Notes chiefly Geological. By Capt. Newbold. *Page.* 224

1847.—Vol. XXI., Part I.—*Local and Relative Geology of Singapore, on the, including notices of Sumatra, the Malay Peninsula. By* J. R. Logan, *Esq.—Page.* . . . 519

Part II.—*Ditto ditto ditto. —Page.* . . . 667

1848.—Vol. XVII., Part I.—*Kohistan of the Jullundhur Doab, a report of the. By Lieut.* W. Hamtayne Parish, *Bengal Artillery. Page.* 281

Probable results of a Scientific research after Metalliferous deposits in the sub-Himalayan range around Darjeeling. By R. H. Irvine, *Esq., M. D.—Page.* . . . 137

1848.—Vol. XVII, Part II.—*Extracts from a letter from Captain James Abbott, descriptive of the Geological and Mineralogical observations in the Hazarie districts.—Page.* . 1135

Journal of the Geological Society of London.

Vol. II.—*Vicary, Capt. N., Geological report on a portion of the Belochistan Hills.—Page.* 260

Vol. III.—*Clark, G. S., Esq., on the neighbourhood of Bombay and certain beds containing Fossil Frogs.—Page.* 221

Conoybeare, W., extract from his report on the country between the summit of the Malsej Ghaut and the Gunthuree.—Page. 225

Introductory note on Captain Vicary's *memoir on the Geology of Scinde.—Page.* . 331

Vicary, Captain N., notes on the Geological structure of parts of Scinde.—Page. . 331

Vol. I.—*Falconer, H., M. D., description of some fossil remains of Denotherium, Giraffe, and other Mammalia, from the Gulf of Cambay in India.—Page.* 563

of Lieutenant Maury. It is more than probable that besides the currents occasioned by the trade-winds, monsoons, and sets of the tides—we have a group of movements intermingled with these dependant mainly on evaporation. When it is remembered that on the western shore of the Arabian Sea, including in this the Red Sea and Persian Gulf, from the line northward, we have an expanse of coast of no less than 6900 miles, and a stretch of country of probably not less than 100 miles inland from this, where the average fall of rain does not amount to four inches annually, where not one half this ever reaches the sea, and where, to the best of our knowledge, the evaporation over the ocean averages at least a quarter of an inch daily all the year round, or close on eight feet annually, some idea of the enormous abstraction of water in the shape of vapour may be formed. On the assumption that this extends no further, on an average, than 50 miles out to sea, we shall have no less than 39 cubic miles of water raised annually in vapour from the northern and north-western side of the basin, which must be supplied from the open ocean to the south or the rains on the east. The fall of rain on the western side of the ridge of the mountain chain from Cape Comorin to Cutch averages pretty nearly 130 inches annually, and of this at least 160 is carried off to the sea: that on the Concan to 70 inches, of which probably 30 flow off to the ocean: or betwixt the two, over an area of twenty miles from the seashore to the ghauts, and about 1200 miles from north to south, or an area of 24,000 square miles in all, we shall probably have an average discharge of nine feet, or close on forty cubic miles, of water,—an amount sufficient, were it not diffused, to raise the sea on our shores three feet high over an area of 72,000 square miles. I may here perhaps be permitted to quote some remarks published elsewhere, which bear very closely on this subject, and may, I think, without impropriety, be included in the present report:—

"The waters of the ocean cover nearly three-fourths of the surface of the globe; and of the thirty-eight millions of miles of dry land in existence, twenty-eight millions belong to the northern hemisphere. The mean depth of the ocean is somewhere about four miles—the greatest depth the sounding line has ever reached is five and a quarter miles. The mean elevation of the land again is about one thousand feet—the highest point known to us is nearly as much above the level of the sea as the greatest depth that has been measured is below it. The atmosphere again surrounds the earth like a vast envelope: its depth, by reason of the tenuity attained by it as the superincumbent pressure is withdrawn, is unknown to us,—but is guessed at somewhere betwixt fifty and five hundred miles. Its weight and its constituent elements have been determined with the utmost accuracy. The weight of the mass is equal to that of a solid globe of lead sixty miles in diameter. Its principal elements are oxygen and nitrogen gases, with a vast quantity of water suspended in these in the shape of vapour; and commingled with these a quantity of carbon, in the shape of fixed air, equal to restore from its mass many fold the coal that now exists in the world. In common with all substances, the ocean and the air are encreased in bulk, and consequently diminished in weight, by heat: like all fluids, they are mobile—tending to extend themselves equally in all directions, and to fill up depressions in whatever vacant spaces will admit them: hence, in these respects, the resemblance betwixt their movements. Water is not compressible or elastic, and it may be solidified into ice or vapourized into steam: air is elastic—it may be condensed to any extent by pressure, or expanded to an indefinite degree of tenuity by pressure being removed from it—it is not liable to undergo any change in its constitution beyond these, by any of the ordinary influences by which it is affected. These facts are few and simple enough—let us see what results arise from them. As the constant exposure of the equatorial regions of the earth to the sun must necessarily here engender a vast amount of heat,—and as his absence from the polar regions must in like manner promote an infinite accumulation of cold,—to fit the entire earth for a habitation to similar races of beings, a constant interchange and communion betwixt the heat of the one and cold of the other must be carried on. The ease and simplicity with which this is effected, surpass all description. The air heated near the equator by the overpowering influence of the sun, is expanded and lightened: it ascends into upper space, leaving a partial vacuum at the surface to be supplied from the regions adjoining. Two currents from the poles towards the equator are thus established at the surface, while the sublimated air, diffusing itself by its mobility, flows in the upper regions of space from the equator towards the poles. Two vast whirlpools are thus established, constantly carrying away the heat from the torrid towards the icy regions, and these becoming cold by contact with the ice,

carry back their gelid freight to refresh the torrid zone. Did the earth, as was long believed, stand still while the sun circled round it, we should have two sets of meridional currents blowing at the surface of the earth directly from north and south towards the equator, in the upper regions flowing back again to the place whence they came. On the other hand, were the heating and cooling influences just referred to to cease, and the earth to fall in impressing its own motion on the atmosphere, we should have a furious hurricane rushing round the globe at the rate of 1000 miles an hour—tornadoes, of ten times the speed of the most violent now known to us, sweeping everything before them.—A combination of the two influences, modified by the friction of the earth, which tends to draw the air after it, gives us the Trade winds—which sweep round the equatorial region of the globe unceasingly at the speed of from ten to twenty miles an hour: the aerial current, quitting the polar regions with the comparatively tardy speed from east to west imposed on it by the velocity due to the 70th parallel, is left behind the globe, and deflected into an oblique current as it advances southward, till, meeting the current from the opposite pole near the equator, the two combine and form the vast stream known as The Trades,—separated in two where the air ascends by the belt of variable winds and rains. Impressed with the motion of the air constantly sweeping its surface in one direction, and obeying the same laws of motion, the great sea itself would be excited into currents similar to those of the air were it not walled in by continents, and subjected to other control. As it is, there are constant currents flowing from the torrid towards the frigid zone, to supply the vast mass of vapour there drained off; while other whirlpools and currents, such as the gigantic gulf stream, come to perform their part in the same stupendous drama. The current just named sweeps from the Cape of Good Hope across the South Atlantic to the Gulf of Mexico, and by the Straits of the Bahamas. Here it turns to the eastward again, travelling along the coast of America at the rate of from forty to a hundred miles a day: it now stands once more across the Atlantic, and divides itself into two branches;—one finds its way into the Northern Sea, warming the adjoining waters as it advances, and turning back, most likely to form a second great whirlpool, rejoining the original stream near Newfoundland. The main branch seeks the northern shores of Europe, and, sweeping along the coast of Spain and Portugal, travels southward by the Azores to rejoin the main whirlpool. The waters of this vast ocean river are to the north of the tropic greatly warmer than those around: the climate of every country it approaches is improved by it, and the Laplander is enabled by its means to live, and cultivate his barley, in a latitude which everywhere else, throughout the world, is condemned to perpetual sterility. But there are other laws which the great sea obeys, which peculiarly adapt it as the vehicle of interchange of heat and cold betwixt those regions where either exists in excess. Water, which contracts regularly from the boiling point downwards, at a temperature of 40° has reached its maximum of density, and thence begins to grow lighter and expand. But for this most beneficent provision, the vast recesses of the Northern Ocean would be continually occupied with a fluid at the freezing point, which the least access of cold would convert into one solid mass of ice. The non-conducting power of water, which at present acts so valuable a part in the general economy, so far from being a blessing would be a curse. No warmth could ever penetrate to thaw the foundations of the frozen mass—no water find its way to float it from its foundations, so that, like the everlasting hills themselves, rooted immoveably in its place, every year adding to its mass, the solid structure would continually advance to the southward, hermetically sealing the Polar Ocean thus condemned to utter desolation, and encroaching on the North sea itself. Under existing circumstances, so soon as water is cooled down to 40° it sinks to the bottom, and, still eight degrees warmer than ice, it attacks the bases and saps the foundations of the ice-bergs—themselves gigantic glaciers, which have fallen from the mountains into the sea, or which have grown to their present size in the shelter of bays and estuaries, and by accumulations from above. Once forced from their anchorage, the first storm that arises drifts them to sea, where the beautiful law which renders ice lighter than the warmest water enables it to float—and drifts southward a vast magazine of cold to cool the tepid water which bears it along,—the evaporation at the equator causing a deficit, the melting and accumulation of the ice in the frigid zone giving rise to an excess of accumulation, which tends, along with the action of the air, and other causes, to institute and maintain the transporting current. These stupendous masses, which have been seen at sea in the form of church spires and gothic towers and minarets, rising to the height of from 300 to 600 feet, and extending over an area of not less than six square miles, the masses above water being only one-tenth of the whole, are often to be found within the tropics. A striking fact dependant on this general law, has just been brought to light: there is a line extending from pole to pole, at or under the surface of the ocean, where an invariable temperature of 39·5° is maintained. The depth of this varies with the latitude: at the equator it is 7200 feet—at lat. 56° it ascends to the surface, the temperature of the sea being here uniform throughout. North and South of this the cold water is uppermost, and at lat. 70° the line of uniform temperature descends to 4500. But these, though amongst the most regular and magnificent, are but a small number of the contrivances by which the vast and beneficent ends of Nature are brought

about. Ascent from the surface of the earth produces the same change in point of climate as an approach to the poles: even under the torrid zone, mountains reach the line of perpetual congelation at nearly a third less altitude than the extreme elevation which they sometimes attain: at the poles, snow is perpetual at the ground, and at the different intervening latitudes reaches some intermediate point of congelation betwixt one and 20,000 feet. In America, from the line south to the tropics, as also, as there is now every reason to believe, in Africa, within similar latitudes, vast ridges of mountain covered with perpetual snow, run northward and southward in the line of the meridian right across the path of the Trade Winds. A similar ridge, though of less magnificent dimensions, traverses the peninsula of Hindoostan, increasing in altitude as it approaches the line,—attaining an elevation of 8500 feet at Dodabetta, and above 6000 in Ceylon. The Alps in Europe, and the gigantic chain of the Himalayas in Asia, both far south in the temperate zone, stretch from east to west, and intercept the aerial current from the north. Others of lesser note, in the equatorial or meridional, or some intermediate direction, cross the paths of the atmospherical currents in every direction, imparting to them fresh supplies of cold, as they themselves obtain from them warmth in exchange: in strictness, the two operations are the same. Magnificent and stupendous as are the effects and results of the water and of air acting independantly on each other, in equalising the temperature of the globe, they are still more so when combined. One cubic inch of water when invested with a sufficiency of heat, will form one cubic foot of steam—the water before its evaporation, and the vapour which it forms, being exactly of the same temperature, though in reality, in the process of conversion, 1700 degrees of heat have been absorbed or carried away from the vicinnage, and rendered latent or imperceptible: this heat is returned in a sensible and perceptible form the moment the vapour is converted once more into water. The general fact is the same in the case of vapour carried off by dry air at any temperature that may be imagined, for down far below the freezing point evaporation proceeds uninterruptedly, or raised into steam by artificial means. The air, heated and dried as it sweeps over the arid surface of the soil, drinks up by day myriads of tons of moisture from the sea—as much indeed as would, were no moisture restored to it, depress its whole surface at the rate of four feet annually over the surface of the globe. The quantity of heat thus converted from a sensible or perceptible to an insensible or latent state, is almost incredible. The action equally goes on, and with the like results, over the surface of the earth as over that of the sea, where there is moisture to be withdrawn. But night, and the seasons of the year, come around, and the surplus temperature thus withdrawn and stored away at the time it might have proved superfluous or inconvenient, is reserved, and rendered back so soon as it is required; and the cold of night, and rigor of winter, are modified by the heat given out at the point of condensation, by dew, rain, hail, and snow.

"There are, however, cases in which were the process of evaporation to go on without interruption and without limit, that order and regularity might be disturbed which it is the great object of the Creator apparently for an indefinite time to maintain, and in the arrangements for equalizing temperature the equilibrium of saltness be disturbed in certain portions of the sea, and that of moisture underground in the warmer regions of the earth. To prevent this, checks and counterpoises interpose just as their services come to be required. It could scarcely be imagined that in such of our inland seas as were connected by a narrow strait with the ocean, and were thus cut off from free access to its waters, the supply of fresh water which pours into them from the rivers around would exactly supply the amount carried away by evaporation: salt never rises in steam, and it is the pure element alone that is drawn off. We have in such cases as the Black and Baltic seas an excess of supply over what is required, the surplus in the latter case flowing off through the Dardanelles, in the former through the Great and Little Belts. The vapour withdrawn from the Mediterranean exceeds by about a third the whole amount of fresh water poured into it: the difference is made up by a current through the Straits of Gibraltar in the latter: and a similar arrangement, modified by circumstances, must exist in all cases where circumstances are similar,—the supply of water rushing through the strait from the open ocean being in exact proportion to the difference betwixt that provided from rain or by rivers, and that required by the efflux of vapour. Seas wholly isolated, such as the Caspian and the Dead Sea, attain in course of time a state of perfect equilibrium—their surface becoming lowered in level and diminished in area, till it becomes exactly of the proper size to yield in vapour the whole waters poured in. The Dead Sea, before attaining this condition of repose, has sunk thirteen hundred feet below the Mediterranean, the Caspian about one-fourth of this. Lakes originally salt, and which to all appearance are no more than fragments severed from the sea by the earthquake or volcano, and which have no river or rain supplies whatever, in process of time dry up and become a mass of rock salt in their former basin. Such is the formation in progress in the lake near Tadjurra, nearly five hundred feet below the level of the sea, its waters having been this much depressed by evaporation, having now almost altogether vanished, one mass of salt remaining in their room. As it is clear in a case such as that of the Mediterranean, that where salt water to a large extent was poured in and fresh water only was drawn off, a constant concentra-

tion of brine must occur, the proposition was laid down by the most distinguished of our geologists, and long held unquestionable, that huge accumulations of salt, in mass larger than all that Cheshire contains, were being formed in its depths. The doctrine, eminently improbable in itself, is now met by the discovery of an outward under-current, in all likelihood of brine. It is matter of easy demonstration, that without some such arrangement as this, the Red Sea must long ere now have been converted into one mass of salt, its upper waters at all events being known in reality to differ at present but little in saltness from those of the southern ocean. The Red Sea forms an excellent illustration of all kindred cases. Here we have salt water flowing in perpetually through the Straits of Babelmandeb to furnish supplies for a mass of vapour calculated, were the strait shut up, to lower the whole surface of the sea eight feet annually,—and even with the open strait, to add to its contents a proportionate quantity of salt. But an under-current of brine, which, from its gravity, seeks the bottom, flows out again to mingle with the waters of the great Arabian Sea, where, swept along by currents, and raised to the surface by tides and shoals, it is mingled by the waves through the other waters which yearly receive the enormous monsoon torrents the Concan and the Ghauts supply, become diluted to the proper strength of sea water, and rendered uniform in their constitution, by the agitation of the storms which then prevail. Flowing back again from the coasts of India, where they are now in excess, to those of Africa, where they suffer from perpetual drainage, the same round of operations go on continually; and the sea, with all its estuaries and its inlets, retains the same limit, and nearly the same constitution, for unnumbered ages. A like check prevents on shore the extreme heating and desiccation from which the ground would otherwise suffer. The earth is a bad conductor of heat: the rays of the sun which enter its surface, and raise the temperature to 100 or 150°, scarcely penetrate a foot into the ground: a few feet down, the warmth of the ground is nearly the same night and day. The moisture which is there preserved free from the influence of currents of air, is never raised into vapour: so soon as the upper stratum of earth becomes thoroughly dried, capillary action, by means of which all excess of water was withdrawn, ceases; and even under the heats of the tropics, the soil two feet down will be found on the approach of the rains sufficiently moist for the nourishment of plants. The splendid flowers and vigorous foliage which burst forth in May, when the parched soil would lead us to look for nothing but sterility, need in no way surprise us: fountains of water, boundless in extent, and limited in depth by the thickness of the soil which contains them, have been set aside, and sealed up for their use, beyond the reach of those thirsty winds or burning rays which are suffered only to carry off the water which is superfluous and would be pernicious, removing it to other lands where its agency is required, or treasuring it up in the crystal vault of the firmament, as the material of clouds and dew,—and the source, when the fitting season comes round again, of those deluges of rain which provide for the wants of the year.

"Such are some of the examples which may be supplied of general laws operating over nearly the whole surface of the terraqueous globe. Amongst the local provisions ancillary to these, are the monsoons of India and the land- and sea-breezes prevalent throughout the tropical coasts. When a promontory such as that of India intrudes into the region of the trade winds, the continuous western current is interrupted, and in its room appear alternating currents from the north-east and south-west, which change their direction as the sun passes the latitude of the place. On the Malabar Coast, as the sun approaches from the southward, clouds and variable winds attend him, and his transit northward is in a week or ten days followed by that furious burst of thunder and tempest which heralds the rainy season. His southward transit is less distinctly marked: it is the sign of approaching fair weather, and is also attended by thunder and storm. The alternating land and sea-breezes are occasioned by the alternate heating and cooling of the soil, the temperature of the sea remaining nearly uniform. At present, when most powerfully felt, the earth by noon will often be found to have attained a temperature of 120°, while the sea rarely rises above 86°. The air, heated and expanded, of course ascends, and draws from the sea a fresh supply to fill its room: the current thus generated constitutes the breeze. During the night the earth often sinks to a temperature of 50° or 60°, cooling the conterminous air, and condensing in the form of dew, the moisture floating around. The sea is now from 15° to 20° warmer than the earth,—the greatest difference between the two existing at sunrise; and in then rushes the air, and draws off a current from the shore.

"We have not noticed the Tides, which, obedient to the sun and moon, daily convoy two vast masses of water round the globe, and which twice a month, rising to an unusual height, visit elevations which otherwise are dry. During one-half of the year the highest tides visit us by day the other half by night: and at Bombay, at springs, the depths of the two differ by two or three feet from each other. The tides simply rise and fall in the open ocean, to an elevation of two or three feet in all: along our shores, and up gulfs and estuaries, they sweep with the violence of a torrent, having a general range of ten or twelve feet,—sometimes, as at Fundy in America, at Brest and Milford Haven in Europe, to a height of from forty to sixty feet. They sweep our

shores from filth, and purify our rivers and inlets, affording to the residents of our islands and continents the benefit of a bi-diurnal ablution, and giving health and freshness and purity wherever they appear. Obedient to the influences of bodies many millions of miles removed from them, their subjection is not the less complete: the vast volume of water, capable of crushing by its weight the most stupendous barriers that can be opposed to it, and bearing on its bosom the navies of the world, impetuously rushing against our shores, gently stops at a given line, and flows back again to its place when the word goes forth—"thus far shalt thou go, and no farther;" and that which no human power or contrivance could have repelled, returns at its appointed time so regularly and surely, that the hour of its approach, and measure of its mass, may be predicted with unerring certainty centuries beforehand. The hurricanes which whirl with such fearful violence over the surface, raising the waters of the sea to enormous elevations, and submerging coasts and islands,—attended as they are by the fearful attributes of thunder and deluges of rain,—seem requisite to deflagrate the noxious gases which have accumulated—to commingle in one healthful mass the polluted elements of the air, and restore it fitted for the ends designed for it. It is with the ordinary, not with the exceptional, operations we have at present to deal, and the laws which rule the hurricane form themselves the subject of a treatise.

"We have hitherto dealt with the sea and air,—the one the medium through which the commerce of all nations is transported, the other the means by which it is moved along,—as themselves the great vehicles of moisture, heat, and cold, throughout the regions of the world—the means of securing the interchange of these inestimable commodities, so that excess may be removed to where deficiency exists, deficiency substituted for excess, to the unbounded advantage of all. We have selected this group of illustrations for our views, because they are the most obvious, the most simple, and the most intelligible and beautiful, that could be chosen. Short as our space is, and largely as it has already been trenched upon, we must not confine ourselves to these.

"We have already said that the atmosphere forms a spherical shell surrounding the earth to a depth which is unknown to us by reason of its growing tenuity, as it is released from the pressure of its own superincumbent mass. Its upper surface cannot be nearer to us than fifty, and can scarcely be more remote than five hundred miles. It surrounds us on all sides, yet we see it not: it presses on us with a load of fifteen pounds on every square inch of surface of our bodies, or from seventy to one hundred tons on us in all, yet we do not so much as feel its weight. Softer than the finest down—more impalpable than the finest gossamer,—it leaves the cobweb undisturbed, and scarcely stirs the lightest flower that feeds on the dew it supplies: yet it bears the fleets of nations on its wings around the world, and crushes the most refractory substances with its weight. When in motion, its force is sufficient to level the most stately forests and stable buildings with the earth—to raise the waters of the ocean into ridges like mountains, and dash the strongest ships to pieces like toys. It warms and cools by turns the earth and the living creatures that inhabit it. It draws up vapours from the sea and land, retains them dissolved in itself or suspended in cisterns of clouds, and throws them down again as rain or dew when they are required. It bends the rays of the sun from their path to give us the twilight of evening and of dawn—it disperses and refracts their various tints to beautify the approach and the retreat of the orb of day. But for the atmosphere, sunshine would burst on us and fail us at once—and at once remove us from midnight darkness to the blaze of noon. We should have no twilight to soften and beautify the landscape—no clouds to shade us from the scorching heat,—but the bald earth as it revolved on its axis would turn its tanned and weakened front to the full and unmitigated rays of the lord of day. It affords the gas which vivifies and warms our frames, and receives into itself that which has been polluted by use, and is thrown off as noxious. It feeds the flame of life exactly as it does that of the fire—it is in both cases consumed, and affords the food of consumption—in both cases it becomes combined with charcoal, which requires it for combustion, and is removed by it when this is over. "It is only the girdling oncircling air," says a writer in the *North British Review*, "that flows above and around all, that makes the whole world kin. The carbonic acid with which to-day our breathing fills the air, to-morrow seeks its way round the world. The date-trees that grow round the falls of the Nile will drink it in by their leaves; the cedars of Lebanon will take of it to add to their stature; the cocoanuts of Tahiti will grow rapidly upon it; and the palms and bananas of Japan will change it into flowers. The oxygen we are breathing was distilled for us some short time ago by the magnolias of the Susquehanna, and the great trees that skirt the Oronoco and the Amazon—the giant rhododendrons of the Himalayas contributed to it, and the roses and myrtles of Cashmere, the cinnamon tree of Ceylon, and the forests older than the flood, buried deep in the heart of Africa far behind the Mountains of the Moon. The rain we see descending was thawed for us out of the icebergs which have watched the Polar star for ages; and the lotus lillies have soaked up from the Nile and exhaled as vapour snows that rested on the summits of the Alps." "The atmosphere," says Mann, "which forms the outer surface of the habitable world, is a vast reservoir, into which the supply of food designed for living creatures is thrown,—or, in one word, it is itself the food in its simple form

of all living creatures. The animal grinds down the fibre and the tissue of the plant, or the nutricious store that has been laid up within its cells, and converts these into the substance of which its own organs are composed. The plant acquires the organs and nutricious store thus yielded up as food to the animal, from the invulnerable air surrounding it." But animals are furnished with the means of locomotion and of seizure—they can approach their food, and lay hold of and swallow it: plants must await till their food comes to them. No solid particles find access to their frames : the restless ambient air, which rushes past them loaded with the carbon, the hydrogen, the oxygen, the water—everything they need in shape of supplies,—is constantly at hand to minister to their wants, not only to afford them food in due season, but in the shape and fashion in which alone it can avail them."

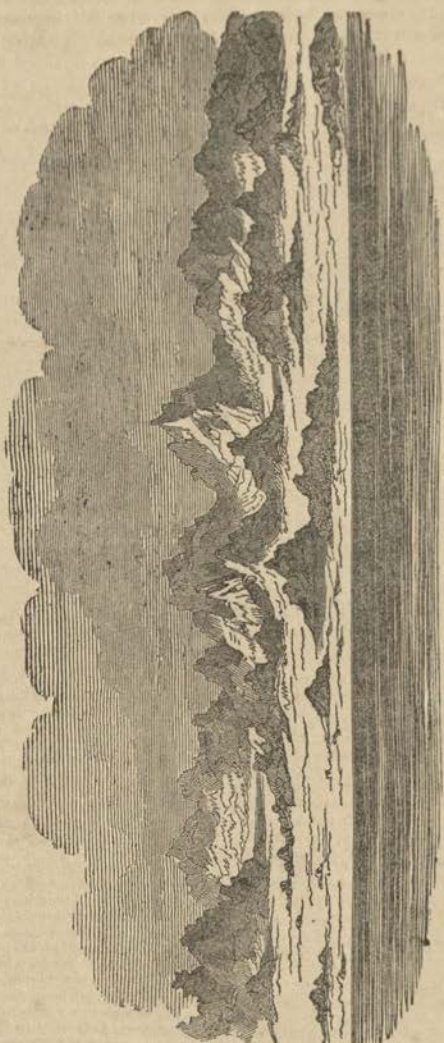
With the view of having my assumptions in reference to evaporation tested by experiment, I applied to Govt. for permission to have an instrument constructed at the steam factory for determining the force and direction of currents at considerable depths under the surface,—having before had an instrument of very simple form made up as a companion to this, with the view of determining the temperature and saltness of the water of the sea. The reply received was like all the others that have been given us by Government to our applications for aid in our pursuits—frank, full, and cordial; and the assistance received under the marine department was everything that could have been desired. The two instruments are at present in the hands of an able and zealous officer, Captain Campbell of the steamer *Queen*, with a view to experiment; and I may, I hope, be able a couple of months hence to lay the results of his labours before the Society. Two papers on these subjects, with drawings and descriptions of both instruments, appear in the forthcoming number of your Transactions. The long delay in the arrival of the instruments ordered from Mr Adie of Edinburgh, together with the avidity with which they were at once taken off our hands, have prevented us hitherto from securing those observations from on ship-board looked forward to with so much hope and anxiety: nor can we now expect them to be taken in hand as desired until the Manual of the Society be placed in the hands of observers. From the experiments of Mr Glaisher and Mr Laidlaw there is every reason to suppose that the amount of evaporation which occurs at low temperatures everywhere in the open ocean at all times has been greatly understated.

But it is not alone with the chemical or hydrostatical conditions of the sea and air we are concerned,—the living things which dwell in its bosom or sport on the surface of the waters are as worthy of examination as the marvels of the waters themselves, which they so often come in the long run so materially to affect. To a leading member of our Society in the earlier stages of its career—Captain Moresby—we are indebted for the great bulk of the knowledge we possess on Atolls and Coral Reefs, and the splendid collection which adorns the shelves of our brethren of the Asiatic Society was contributed from our museum, on which it was originally conferred by Captain Moresby. Mr Darwin, the latest labourer in the field of research, acknowledges his obligations for the bulk of his facts to the quarter referred to; and it ought not for a moment to be forgotten that with this single exception, our knowledge of this branch of Zoology has, so far as enquirers in the east are concerned, for the past ten years made scarcely any progress amongst us. But not only is the basin of the ocean being in some places invaded, narrowed, or filled up, by the agency of Zoophitos, I have in the course of the year had repeated occasion to bring before the notice of the members of this or of the Asiatic Society another species of modification to which at no great distance of time our shores have been subjected. There can, I think, no longer remain a doubt that there is along the whole of our shores, from Ceylon to Suez, abundant evidence of a depression and subsequent elevation of the land and sea. At Sowree the raised beach, which consisted entirely of sand, gravel, and sea-shells such as those now found on our shores, is in most places converted into a solid concrete by cementation. The lime dissolved during the monsoon, when the water which every-

where abounds, is impregnated with carbonaceous matter, or fixed air, is thrown down as the season advances, and forms a variety of cementation from which the concrete in question, as well as the konkur, or limestone nodules, and another variety of stony concretion about to be adverted to, derive their origin. Of this material a large number of the oldest houses in the native town were built. The raised beach, whether loose or solid, extends over the drill-ground Colaba, the lower part of the Observatory compound on the harbour side, and the whole of the Esplanade. It stretches out to the base of Malabar Hill, and so on towards Tardeo, where it is overlaid by a lagoon, or silt formation of very recent origin. It re-appears near Worlee, and extends all under Mahim Wood northward, and so on by Mahim, and continues towards Sion, re-appearing, after some interruption, along the verge of Sewree Bay, and under the village of Sewree. Along Sewree Bay is a large bed of blueish clay, filled with mangrove roots, konkur, and other matters, which I had often examined, and always believed to have been a bed of more recent origin than the newer pliocene—to have been deposited, in fact, as the ground was in process of elevation. It is obviously older than, and in several respects different in character from, the recent mud deposits in the neighbourhood, and attains a considerably higher level, being found at several points above high-water mark, where clayey matter could not have been deposited. The torrents of the 17th September 1849 dispelled the illusion, and furnished a beautiful section, exhibiting a bed of three or four feet of clay, laying under a mass of from four to six feet of shells, gravel, and concrete. On surveying the beach with much care, I found the clay bed to extend from end to end; and at some places the difference betwixt the lowest level of the lowest mangrove roots in the clay bed and summit of the concrete was from fourteen to eighteen feet. The strata of the concrete dip slightly three or four degrees towards the east, and occasionally vary considerably, so that the upward movement which raised them to their present level has not been tranquil or uniform. Near the fort the lower beds have been washed away, and some seventy yards down the beach large masses of concrete, ten or twelve feet square, and two or three feet thick, are laying strewed over the clay bed in which the old mangroves still abound. This is an evidence that the sea is here advancing—the tough clay and harder strata of the concrete alone withstanding its ravages—the intervening deposit, to the extent of many acres, has been carried away. Throughout the whole of Mahim wood this bed of littoral concrete prevails to the depth of from six to fifteen feet: underneath it, as at Sewree, is a bed of blue clay with mangrove roots. The same thing appears at the western extremity of the esplanade—a mass of quicksand intervening betwixt the rocky matter and the clay. Kindred formations are to be found at Gogo, and I believe along the Gulf of Cambay and again at Kurrachee: I do not know that the upper strata have been determined further to the westward, but a shell beach from three to fifteen feet above the level of the sea is distinctly visible on the shores of Aden and all around, and so by those of the Red Sea on both sides to Suez. The following drawing and description of this, taken from a journal of a journey overland, published four years since, will explain the appearances here pictured:—

"I have already remarked that the Suez Desert everywhere bears traces of having at one time formed the bottom of the sea, and that near Suez the upheaval has obviously been of very recent date indeed. The subjoined sketch represents the mountains on the African shore: one in the extreme distance not shown in the drawing attains an elevation of 10,000 feet. They rarely come here within some miles of the margin of the sea: but all between is a gently sloping plain of sand retiring far away amongst their recesses, just as if a tide of some 100 feet in depth had left them for some hours before, and might speedily roll back again. The whole is evidently the sand raised from the bottom of the sea where the sediment quietly arranged itself around the base of the rocks with which it was afterward elevated to the surface. Here indeed the proofs of the fact are simple enough: there are no watery torrents to bring sand from the interior—the tide is too slight to produce material for drift, even were the undulations and hillocks drifting always exhibits, apparent—so that the theory of upheaval is not only the most probable but absolutely the only one that will account for the phenomena. In some places the sand drift lies in masses several thousands of feet up the slope of the hill: in others the whole

hill is covered over with it—the contour of the rocks being preserved. It nowhere resembles common drift, and looks as if the mountain when yet under the sea, had been covered over with sand by some submarine current. They could in many cases only be described as 'aprons of sand.'"



ROCKS ON THE AFRICAN SHORE NEAR SUEZ.

I have no information as to how matters stand in this respect on the Coromandel Coast, but judging from the accounts contained in the Bengal Asiatic Transactions of the borings for water near Calcutta, I should suppose that exactly the

same phenomena might be traced along the upper end at all events of the Bay of Bengal.

The subject was all the more attractive to me as associated with a kindred one pursued many years since at home. The following in reference to the raised beaches on the eastern coast of Scotland, bears so closely on what has been stated, that I may here be pardoned for quoting it :—

"The evidence of change of level furnished by old beaches where inland cliffs still exist, is often extremely beautiful. Three of these, at different elevations, have been traced by Mr R. Chambers along a large portion of the east coast of Scotland—the lowest, as may be imagined, is by far the best defined.

Fig. I.

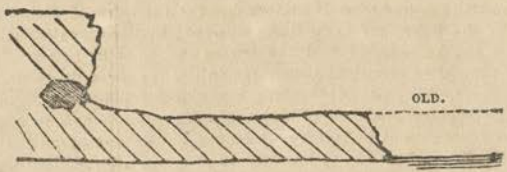
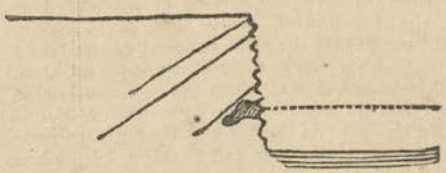


Fig. II.



"On some parts of the shore it is very broad, in others it disappears altogether ; and if the stratification be examined, it will be found that where the strata dip under the water, and the tablets of rock present themselves to the surge so as to afford the greatest resistance to the waves, (as in Fig. I.) the beach remains entire, with caves and excavations, and all the other characteristics of a worn seacliff at its base. Where the reverse occurs, and the rock is exposed to the action of the breakers, (as in Fig. II.) the old beach is gone, the sea having advanced to its former shore. If the cliff be not too much worn away, we have what used to be so perplexing to naturalists—caverns and excavations half way up the cliff at an elevation the sea could, excepting on the supposition of the change of level under consideration, never have reached. In the Morea there are four terraces or old beaches, at regular intervals from each other ; and in Sicily there is a considerable number of them. These, as might be expected, all abound in caves : one of these is 180 feet above the level of the sea, and two miles inland : it is 20 feet high, and ten wide. But we have not only evidence in profusion of long periods when the earth was in a state of uniform ascent, or of alternate ascent and repose, but we have proof equally positive, though less abundant, of alternate ascents and descents on a large scale, and within very recent times. The most gigantic and striking illustration given of this, is that supplied by the portico of the temple of Seropis, at Puzzuoli near Naples. This temple had remained unnoticed till about 1749, when the heads of the columns were discovered half hid by brush wood. It was carefully examined by Captain Smith in 1820, and re-examined and measured by Mr Babbage in 1828. The only parts of it we have to do with are three columns of the portico, forty feet high, and two feet and a half in diameter at base. For about twelve feet up the surface of the marble is smooth and uninjured, when for three feet more it is perforated everywhere by marine borers, the shells of which remain in the cavities. The floor of the temple is some feet under the level of the Mediterranean. Its history has so far been determined that we know it to have been built in the second century : from the third to the middle of last century we know nothing of it. It is clear, from the state of the portico, that it must have sunk pretty rapidly for the first twelve feet, so as to leave the borers no time to injure it, until it was under the level of the bottom of the sea : the next twelve have for a long time been exposed to the operations of the borers : and after the temple had sunk some twenty-eight or thirty feet—for its floor is likely at first to have been some feet above the sea level—it must have risen twenty-three feet to attain its present position. Both depressions and elevations must have gone on gradually, as the columns are but little shaken off the perpendicular. All this must

have occurred within the space of 1600 years. The temple is said to be once more descending under water. In the estuary of the Tay in Scotland, kindred phenomena exist, though we cannot concentrate them within any date. In the Carse of Gowrie, betwixt Dundee and Perth, there is a submerged forest about five feet below high water: seven feet above this there is a bed of sea shells, over which there is from ten to twenty feet of river mud, now about eight feet above high water, and constituting the rich wheat soil of the Carse. Here we must have had the bed of the river high and dry enough to bear trees: this must gradually have sunk eight or ten feet at least, till a shell bed accumulated in the mud banks: the depression must have gone on till this was buried under sixteen feet of silt deposited by the river, when a change of the order of things converted descent into ascent, the latter advancing till the shell bed was raised above high-water mark, and the upheaval altogether amounted to twenty feet at least. The same thing seems to have occurred in the estuary of the Forth; and probably all along the eastern shore of the island."

The tendency of all research in the present day is practical: with all our anxiety to enlarge the boundaries of knowledge for the sake of the enjoyment the amplification of the field confers on those who seek to discover abstract truth for the sake of truth,—the knowledge and the truths the present age prefers are those which can be turned to practical advantage in the every-day affairs of life. I have, in the course of the past eighteen months, had repeated occasion to call the attention of the Society to a class of meteorological phenomena, in whose existence there seemed strong reason to believe—phenomena not yet by any means determined beyond the reach of doubt, but now in progress of investigation. The laws which govern the trade winds, the monsoons, the land and sea-breezes, have long been perfectly well understood, and the phenomena attendant on them anticipated with perfect certitude: those of the cyclone or revolving hurricane have of late years become nearly as well ascertained as those of the more tranquil movements of the air. While conducting the meteorological department of the researches of the Society, I was, at a very early stage of my enquiries, struck with two classes of atmospheric disturbances, one of which had been referred to by meteorologists merely—the other had altogether escaped attention. Both consisted of disturbances of moderate violence: in the one case the perturbation travelled from point to point at the rate of betwixt fifteen and twenty miles an hour: the other class occurred simultaneously, or nearly so, for the space of 25° of latitude at least, and swept half round the world. It appeared much more than probable, moreover, that this class of storms occurred at stated intervals—whether solar or luni-solar I am unable to guess,—but the enquiry, so far as it has gone, has strongly tended to bear out the presumptions that were started with. Combined with these the advancement of medical meteorology was looked for, and the following may be given as to the progress of the enquiry up to the present time:—

"From a very remote period it has been the custom in all parts of India to have meteorological returns forwarded from hospital stations to the presidency medical board, but this was in general looked on as mere matter of form: the only instrument in general observed was the thermometer, and this was most commonly hung up with much more regard to the convenience of the hospital assistant than the position best suited for the instrument. Rain-gauge observations were occasionally met with—hygrometrical returns sometimes—barometric observations almost never. In 1849 the subject received the careful consideration of the Calcutta medical board, and it was resolved to provide the principal outstations with the best instruments that could be procured. The forms proposed were those made use of in the Surveyor-General's office—familiar to the readers of the Calcutta daily papers, in which they may be met with weekly. About the beginning of the year (1849) the Court of Directors sent out twelve standard barometers to Calcutta, and these were forwarded to Chittagong, Rampore Boalcah, Benares, Cawnpore, Bareilly, Umballa, and Neemuch,—one being placed in the medical college with the view of familiarizing the pupils with its use.* Unfortunately the majority of these instruments were rendered unserviceable by injuries received on the way, and it is to be hoped that hereafter a more portable and less expensive and destructible variety of barometer will be

* The term Standard is often so loosely applied, that it is difficult to know to which particular class of barometers it refers: here it is presumed to apply to the great standards of Newman, with which maker the Court of Directors have of late chiefly dealt, and such as are to be found in the Colaba, Trevandrum, Madras, Calcutta, and Lucknow, observatories. If this be the case, then nothing could exceed the injudiciousness of the selection for India,—the extreme difficulty of moving such instruments from place to place greatly exceeding any advantage they possess over mountain or portable barometers.

selected for use,—the standards of Newman being so extremely susceptible of injury that they ought to be confined to the great fixed observatories, where they have no occasion ever to be meddled with when once set up. Colonel Boileau, superintending engineer in the north-west provinces, had long before this devoted himself to the subject of meteorological observations, and strongly recommended that every officer in charge of public works should be provided with the means of making them. There are at present about fifty divisions of public works, twelve more of canals, rivers and roads, under the military board alone about eighty officers ready to undertake the task, and to whom we believe by this time the means of performing it have been provided. The Calcutta medical board took up the matter with the spirit which became them, and the arrangements for the division of the work to be executed by the officers under the military board have of late been entrusted to the deputy surveyor-general,—and into abler or fitter hands they could not have fallen. The Bombay Government meanwhile has issued instructions to all their civil surgeons, and medical men resident at foreign courts, to prosecute a plan of observation similar to that followed in Bengal—taken up by them of their own accord, however, before they became aware of what was in progress elsewhere. The work commenced with the commencement of the year, and is now going on swimmingly. There being at first a difficulty in providing instruments, the various medical officers were left to supply themselves as they thought best, Government meeting the charge,—a most judicious arrangement, which leaves each at liberty to select as he thinks fits, and avoids the delays and inconveniences official correspondence invariably occasions. The arrangements made during the past or present year will gain in profuseness as time advances and practice perfects the observers in the task assigned to them; and not only will the returns from each observatory become better every year, but the observatories themselves will become multiplied all around. We are thus, it will be seen, after the example set us at home, at length beginning to collect and accumulate facts as food for speculation,—facts which, when collected in sufficient mass, reduced, compared, and digested, may come to throw a blaze of light on medical science; and as the knowledge of the laws of hurr canes teach the mariner to avoid, or even take advantage of, the storms heretofore so destructive to him, the medical man may be enabled either to neutralise the effects of the poison with which the air, it seems, is filled, and to fortify the frame against its attacks, or remove it in time beyond the reach of its influence. However and whenever these things may be attained by the help of the light the study of meteorology supplies, clear it is that even in the present state of our knowledge much might with moderate diligence and enterprise be effected in preventing manufactories or storehouses of malaria from coming into existence. It is not deemed too much to expend some millions annually in protecting our frontiers from the incursions of the predatory hordes on our borders,—incursions which, if permitted, might occasion the loss of a few hundreds of lives, or of property equal in value to half or a third part the amount of the sums expended in protecting it: and no one will deny the wisdom of the policy on which we act. Yet a single nuisance in a single populous district, such as the town drain of Bombay, destroys in all likelihood many times the number of people that would fall a sacrifice to the assaults of the mountain robbers on our frontier were there not an outpost left betwixt Shikarpore and Peshawur.—In Bengal, instruction in meteorology is made an essential part of the medical education of the natives, and it is hoped that very speedily the system may become universal, not only in our medical, but in all our colleges. The Calcutta Board of Education have had it under their consideration to employ their schoolmasters in collecting meteorological information: and no wiser measure could be adopted."

I have already adverted to the extreme importance of collecting information on the growth of Corals in our seas. A downward or upward movement of ten or twenty feet would in a great measure account for the appearance of the numberless coral islands, reefs, and atolls, with which our seas are sprinkled. The Polype at work near the surface when the descending movement began would continue accumulating matter upwards as the depth of the water above increased. The elevation, whether sudden or gradual, which raised the Esplanade and the whole mass of raised beach and littoral concrete, would bring to light the whole of the reefs not higher than the amount of the upheaval. At the period when the Bombay Esplanade was covered by the sea, scarcely any of the Maldive, Laccadive, or Seychelles Islands, could have been above water at all. At this date our own little island must have been divided into a dozen of islands at least. First we should have Colaba forming two, one where the Light-house and Observatory stand, the next where the Officers' quarters are built, the sea crossing the line of the present road at the conjee houses near the Catholic Chapel. At the Colaba church it would be altogether submerged from thence. A reef, and then sea all along to near the Custom house, Nowrojee's hill, Mazagon,—the ridge from Chinchpoogly to Matoonga by the back of Parell came next. The ridge from Jackrance's bunder by Balcairn, and on by the back of the Society's gardens, then under water, following. Malabar and Tardeo Hills would form the largest of our islands, the Flats and Native Town being of course all under the sea. Love Grove would then be separated from

Worlee hill by the creek at the sluices, and from Worlee to Sion, the whole of Mahim Wood, and the grounds around Matoonga, would be sea. A more beautifully picturesque arrangement cannot be conceived. The elevation which thus changed the aspect of our shores doubtless brought the great deltas of the Taptee, the Indus, &c., above the water. In the case of the former, indeed, nothing can be more clear than that the sandy ridge stretching along the shore by Domus was the old bar of the Taptee, when the plains around Surat were submerged, or were in sight only at low water, as we now find the sand and mud banks off the mouth of the Gulf of Cambay rapidly filling up with silt. Great East Indiamen anchored off Surat 200 years ago: a large pattimar can scarcely now get across the sand banks. In speaking on the formation of Deltas, the hydrostatical principle, which renders it impossible that mud banks should be laid down by running water, however gentle its flow, seems to have been forgotten. Sand or gravel banks are formed in abundance by currents—mud as fine as that composing the deltas of the Nile, the Ganges, the Taptee, and Indus, remains for hours suspended even in stagnant water—it is carried out in the freshes many miles to sea, and is never at all precipitated, unless in a state of complete repose. I will venture to affirm that there is no case in existence of a mud bank existing in the channel of a flowing stream, however tranquil or gentle its flow. Argillaceous or silty detritus must, as a matter of course, have everywhere been deposited under the level of the tide, and raised above it by some extrinsic cause of elevation—in all likelihood the same which gave us our upheaved beaches, our littoral concrete, so abundantly and beautifully manifested on our shores, and so eminently worthy of the most careful examination. I may, I trust, be pardoned for calling the attention of our survey officers to these things, as being possessed of more than ordinary interest, and laying peculiarly to their hands. These are all in perfect harmony with the phenomena now under discussion, and though throwing back the formation of river deltas far beyond the historic period in which it has hitherto been looked for, we may yet find a sufficiency of data for determining the geological æra to which it belonged by the primeval groups of events and zoological epochs with which it was simultaneous. It is one curious fact connected with our littoral alluvial formations in India, that they all contain fragments of Laterite, though in the case of the Gangetic deltas there are no vestiges of that rock in situate within many hundred miles of the locality where its detritus is now met in with. Even with us the laterite of the delta of the Taptee and the shores of the Gulf of Cambay must have been removed from its present rock by causes difficult to be imagined. It could not have been brought into its present position by the agency of the ocean, or of river floods, and we are thrown back on the hypothesis that at the period referred to the formation itself was of much more extreme prevalence than it now is; and that it extended over tracks of country where it now no longer appears.*

* Laterite is to be found in great abundance in fragments—there are no traces of the rock itself—along the shores of Bombay, Trombay, Elephanta, and Salsette—in the islands of Henery and Kenery to the south, and on that of Bassein to the north, and all around the shores of Surat and Gogo. How much further north and south of these localities I am unable to say. Its existence on an island like Kenery, separated from the mainland by a channel of some breadth, is proof enough that its transport could not have been occasioned by the agency of fresh water currents, unless under circumstances very different indeed from those now existing; the following notice of the borings at Calcutta and at Gogo, contained in the Journal of the Bengal Society, bear closely on these subjects:—

"*Boring operations at Fort William, July 5th*, 1837.

"The Chief Engineer (Calcutta) has the satisfaction of stating that at length a stratum of clay has been reached, at a depth of 380 feet, and that the auger having penetrated 18 inches further has brought up blue clay mixed with a large quantity of apparently decayed wood, a specimen of which accompanies; the tubes have only gone down 377 feet, but it is hoped that they may be forced down through the remainder of the bed of sand to the clay to-morrow, when by a cessation of the influx of sand the operation will proceed with much more rapidity."

It may be remembered that in the 7th volume of our Transactions, page 249, the following extract from the log of the steamer *Victoria* was given, under date 14th August 1846:—

"3. The morning of the 14th was ushered in with very cloudy weather, the atmosphere close and oppressive, but nothing that would indicate the approach of so severe a squall as we experienced. About 10 o'clock observed a thick mass of black clouds extending along the Horizon from N. W. to S. W. Then came a most vivid flash of Lightning, followed by a distant, though peculiarly distinct, sound of Thunder.

"4. We were passing the Zebayer Islands at the time, when just after the first flash of Lightning we observed the Island marked on the Chart as Saddle Island, Latitude 15° N., Longitude 42° 12′ E., smoking, the smoke issuing from its summit in a narrow spiral thread. At this time it bore N. N. E. from us, distant about three miles; we were steering N. W. by N. Shortly afterwards the smoke issued forth in a dense sulphury-looking cloud; the squall burst upon us, and it was shut out from view.

"5. The Zebayer Islands are all of volcanic origin, but there is neither record or tradition of their having been in active operation. Jibbel Teer, in Latitude 15° 32′ N., Longitude 41° 55′ E., was observed to be smoking when visited by the officers of the *Benares* during the survey of the Red Sea in 1832, but never since. There is a tradition among the Arab Pilots of its having been "on Fire" some 50 years ago; it bears the name of Jibbel Dookan among many of them, viz. "Hill of Smoke." It certainly has the appearance of having been in active operation at a much later period than the Zebayer Islands."

The appearance of the clay is precisely that of the black peat-clay found at the depth of 14 to 20 feet below the surface, and it must be the debris of a similar *Sundarban* tract formed anterior to the deposit of the 380 feet of superincumbent sand and clays. The wood is highly charred, but by no means converted into coal.—*Bengal Asiatic Transactions*, Vol. VI., p. 498.

VIII.—*Section of the strata passed through in an experimental boring at the town of Gogah, on the Gujerat peninsula, Gulph of Cambay. By Lieutenant* GEORGE FULLJAMES.

Agreeably to my promise I have the pleasure to enclose a section of the strata penetrated in the bore at *Gogah*, by which you will perceive we have succeeded in reaching a considerable depth, and although the work is still progressing, I have thought it better to send a section of what has already been done. I have only 23 feet of rod left, and unless I can succeed in changing the stratum before that is expended, I shall be obliged to stop. Had I but cast-iron pipes to lower I should not at all despair of success until at any rate I had reached 600 feet. From the sides of the bore falling in while the work is at rest I have been obliged for some time to employ two parties, and to keep going night and day.

I have much pleasure in mentioning that I have discovered fossil remains down the coast, and in similar formation to that of *Perim*. The specimens that I have obtained however are not good ones, having been for a long time exposed to the action of the sea, and atmosphere. Should I succeed in obtaining any that appear worthy of the acceptance of the Asiatic Society, I shall do myself the pleasure to forward them.

A similar formation to that of *Perim* exists along the whole line of coast from *Gogah* to *Gossnat* point, where a firm sandstone is quarried, and of which the splendid *Srâwak* temples of *Pattitona* are all built.

This fact ascertained, settles the question of whether *Perim* was originally a part of the continent:—and it only remains to prove how the separation has taken place? My opinion is that it has been effected by the force of the current during the ebb tides and the swells of the sea during the south-west monsoon.

To the north-west of *Gogah* and about one mile inland I picked up a piece of the rib of some large animal. The rock had been here dug out for building. It lies nearly horizontal and not above eight inches in thickness. I am still in hopes of getting some more fossil specimens from this spot.

List of Strata.

	Ft.	In.
Rubbie containing broken stones, tiles and ashes,...	4	0
Hard earth with stones imbedded,...	1	0
Sand and gravel mixed and salt water,...	11	0
Stiff black clay like that on the beach,...	6	0
Sandstone in thin seams,.....	0	4
Sand and clay, yellowish in color,...	9	8
Sandstone soft,...	13	6
Reddish sand holding salt water,...	0	6
Sandstone hard,.....	2	0
Sand yellow,.....	0	4
Sandstone,...	0	8
Gravel and clayey sand,...	1	0
Very stiff clay with pieces of sandstone imbedded very hard,...	4	0
Stiff blackish looking clay,...	1	0
Sandy clay with pieces of sandstone,...	4	0

As it is quite as important to eliminate error as to discover truth, I may mention, on the authority of a distinguished officer of the Indian Navy, Captain Ethersey, that there is now no reason to doubt that Captain Barker was in this matter misled by appearances. It turns out that the *Hindostan* steamer was at the hour referred to, on the occurrence of the squall here described, in such a position in reference to the *Victoria* as that her smoke would appear over the Zebayer Islands while the hull of the vessel herself was hid: the narrow spiral thread which first appeared, followed by the dense sulphureous looking cloud, closely corresponding with the appearance of a steamer's smoke as seen from behind a rocky island. A volcanic explosion so manifest as this was supposed to have been, must have been observed by the *Hindostan* and by the native craft within sight, and was a thing much too remarkable not to have become so speedily noised abroad in all directions as to have been heard of from Judda, Aden, and other quarters, whereas the only notice ever taken of it was that just quoted.

There can be no doubt whatever that Aden, Gibbel Teer, and many of the hills and islands around, are volcanoes, which may probably have been in a state of acti-

Yellow sand with seams of clay containing a few pieces of sandstone,...	6	0
Very hard siliceous sandstone,...	9	0
Stiff yellow and whitish clay with kankor,...	0	2
Stiff yellow and whitish clay with nodules of sandstone,.....	5	10
The salt water rose 4 feet in the bore and became brackish. Nodules of sandstones imbedded in sand,...	11	0
Yellow sandy clay,...	8	0
Yellow sandy clay with pieces of mhur,...	16	0
Stiff black clay with pieces of sandstone containing a good deal of mica,.....	3	0
Stiff black clay but darker,...	2	0
Stiff clay greenish in color, containing small pieces of rocks similar to cornelian, quartz, and agate, also pieces of broken shells,...	4	0
The same clay with less stones, a strong smell of hydrogen gas came up the pipe, a quantity of pyrites was also brought up,...	1	0
Blue clay with pyrites, and latterly a little sand between the layers of clay,...	19	2
Blue clay with siliceous sand mixed, also pieces of rock, such as sandstone : quality, a greenish sandstone full of holes, these holes are full of clay and pyrites : indurated clay and small black particles like coal,...	8	3
Slate from the appearance of what came up attached to the jumper,..	1	2
Stiff blue clay,...	14	0
Indurated clay or slate, and latterly with sand intermixed, ...	7	7
Blue sandy clay with siliceous sand separating the seams of clay,...	6	5
The same with pyrites,...	3	7
Sandy clay with small white pebbles, a good deal of sand appeared between the layers of clay with fragment of what appears a jet, a piece of a broken shell resembling the cockle was brought up,...	4	0
Blue clay darker in color,..	7	0
Blue clay with pieces of whitish earth,...	4	5
The same sandy clay with here and there a little pyrites,.....	32	4
The same clay with a little more sand between the seams,.....	7	2
Stiff clay containing black, white and yellow colored earths, also some pieces of rock was brought up,...	3	10
Stiff blue clay with seams of white sand,...	4	6
The same clay with a few pieces of rock,...	0	9
Stiff blue clay,...	10	0
Bluish-lias clay with shells and some pieces belonging to coral,...	2	0
Stiff black earthy clay containing broken shells,...	19	0
Very stiff blue clay with a good deal of sand whitish in color,...	6	5
Bituminous clay containing a large quantity of pyrites, fossilized wood which burns,.....	4	11
Stiff blue sandy clay,...	17	0
Stiff blue sandy clay with seams of the bituminous clay occasionally,..	10	8
	320	0

P. S.—Since this was written the Bore has been carried 15 feet deeper without any change in the soil. The lignite or fossil wood burns, and omits a smell of coal; with nitric acid it effervesces and a bright brown smoke arises; with sulphuric acid this does not take place: on burning, it gives out a very strong suffocating smell of sulphur and arsenic.—*Ibid*, pp. 786-88.

vity within the historic period. though on this point I feel doubtful.* No doubt at all can I think be entertained that no explosion has occurred, or signs of volcanic activity been observed, within many centuries of the present time. The following extract from Bruce's travels gives a picture of matters as they stood in 1775, which corresponds exactly with the appearance presented by Gibbel Teer at the present time—the white patch near the summit of the hill here alluded to is very easily mistaken for a little cloud of smoke :—†

"This island is covered with a kind of bent grass, which want of rain, and the constant feeding of the few goats that are kept here, prevent from growing to any height. The end of the island, near the north cape, sounds very hollow, underneath, like Solfaterra, near Naples; and as quantities of pumice stones are found here, there is great appearance that the black hill was once a volcano. Several large shells from the fish called Bisser, some of them twenty inches long, are seen turned upon their faces, on the surface of large stones, of ten or twelve ton weight. These shells are sunk into the stones, as if they were into paste, and the stone raised round about, so as to conceal the edge of the shell; a proof that this stone has, some time lately, been soft or liquified. For, had it been long ago, the weather and sun would have worn the surface of the shell; but it seems perfectly entire, and is set in that hard brown rock, as the stone of a ring is in a golden chasing."—*Bruce's Travels*, Vol. II, page 224.

"The reason of its being called Jibbel Douhan, the Mountain of Smoke, is, that, though in the middle of the sea, it is a volcano, which throws out fire, and, though nearly extinguished, smokes to this day. It probably has been the occasion of the creation of great part of the neighbouring islands. Did it burn now, it would be of great use to shipping in the night; but in the earliest history of the trade of that sea, no mention is made of it, as in a state of conflagration. It was called Ornoon in Ptolemy, the Bird Island, the same as Jibbel Teir. It is likewise called Sheban, from the white spot at the top of it, which seems to be sulphur; and a part seems to have fallen in, and to have enlarged the crater on this side. The island is four miles from south to north, has a peak, the form of a pyramid, in the middle of it, and is about a quarter of a mile high. It descends, equally, on both sides, to the sea; has four openings at the top, which vent smoke, and sometimes, in strong southerly winds, it is said to throw out fire. There was no such appearance when we passed it. The island is perfectly desert, being covered with sulphur and pumice stones."—*Ibid*, pages 232-233.

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* The following note by Dr Bird is appended to the account of Aden given by Captain Forster in the second volume of our Transactions. I confess I entertain very strong doubts of the statements of the Arab Historians on the subject: the aspect of the hills at once suggests their character to any one who has ever seen a volcano, or heard one described; and it seems to me as if he must have been ascribing to the mountains of his own country the characteristics he had heard ascribed to the Sicilian volcano. The naphtha, which forms a considerable article of commerce with the Persian Gulf, and is used in place of turpentine by natives, does not come from the volcanic country at all: it is found in tertiary limestone.

"Captain Forster's opinion of the volcanic origin of Cape Aden and the coast in its neighbourhood, is supported by the accounts which the Arab historians give of an existing volcano in this district. In A. D. 943, Masudi, speaking of the production of Naphtha, and alluding to the volcanoes of Sicily and the kingdom of the Maha Raj, says—'Next to these is that in the desert of Barkut, adjacent to the province of Nasafan and Hadramut, in the country of Shaker (the Arabian coast from Hadramut to Aden,)—the noise of which is like thunder, and to be heard many miles distant. Whenever small things are dropped into its mouth they are not returned, but the sparks which issue from it are like red hot stones, and are reduced to this state by the strong heat of the caves.'"—Note by Dr Bird on Captain Forster's account of Cape Aden. *Bombay Geographical Transactions*, 184[illegible], Vol. II., page 25.

† I conceive that I have completely made out the case Mr Darwin desires to see proved —that of a very recent subsidence and subsequent elevation along all our shores. I may perhaps be permitted the liberty of taking the following somewhat long quotation from Darwin :—

"In the *East Indian Archipelago*, many authors have recorded proofs of recent elevation. M. Lesson (*a*) states, that near Port Dory, on the north coast of New Guinea, the shores are flanked, to the height of 150 feet, by madreporitic strata of a modern date. He mentions similar formations at Waigiou, Amboina, Bouron, Ceram, Sonda and Timor: at this latter place, MM. Quoy and Gaimard (*b*) have likewise described the primitive rocks, as coated to a considerable height with coral. Some small islets eastward of Timor are said in Kolff's Voyage (*c*) to resemble small coral islets upraised some feet above the sea.

(*a*) Partie Zoolog. Voyage de la Coquille.
(*b*) Ann. des Scien. Nat., tom. vi. p. 251
(*c*) Translated by Windsor Earl, chapters vi. and vii.

It would be eminently desirable, and ought not to be very difficult, to obtain a set of good drawings and memoirs, and sets of specimens from the numerous volcanoes near the mouth of the Red Sea.

A few years since a great burst of light, supposed to be a volcano, was seen off the Coast of Arracan.* Vessels were sent out immediately afterwards to take soundings and examine the spot with the utmost care. No scoriæ, no appearance of heat, of dead fish, or other indications of an irruption, could be discovered, and no intimation of the depth or character of the bottom could be detected.

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* Books of reference are allowed to be taken out of our libraries, and though I have read the details of this somewhere in the journals of the Bengal Asiatic Society within these few months I am unable to lay my hands on the quotation. I am nearly certain I have given the substance, if it correctly.

Dr Malcolmson informs me that Dr. Hardie found in *Java* an extensive formation, containing an abundance of shells, of which the greater part appear to be of existing species. Dr. Jack (*d*) has described some upraised shells and corals, apparently recent, on Pulo Nias off *Sumatra*; and Marsden relates in his history of this great island, that the names of many promontories show that they were originally islands On part of the west coast of *Borneo*, and at the *Sooloo Islands*, the form of the land, the nature of the soil, and the water-washed rocks, present appearances, (*e*) (although it is doubtful whether such vague evidence is worthy of mention,) of having recently been covered by the sea; and the inhabitants of the Sooloo Islands believe that this has been the case. Mr Cuming, who has lately investigated, with so much success, the natural history of the *Phillippines*, found near Cabagan, in Luzon, about fifty feet above the level of the R. Cagayan, and seventy miles from its mouth, a large bed of fossil shells: these, he informs me, are of the same species with those now existing on the shores of the neighbouring islands. From the accounts given us by Captain Basil Hall and Captain Beechey (*f*) of the lines of inland reefs, and walls of coral-rock worn into caves, above the present reach of the waves, at the *Loo Choo* Islands, there can be little doubt that they have been upraised at no very remote period.

"Dr Davy (*g*) describes the northern provinces of *Ceylon* as being very low, and consisting of a limestone with shells and corals of very recent origin; he adds, that it does not admit of a doubt that the sea has retired from this district even within the memory of man. There is also some reason for believing that the western shores of India, north of Ceylon, have been upraised within the recent period. (*h*) *Mauritius* has certainly been upraised within the recent period, as I have stated in the chapter on fringing-reefs. The northern extremity of *Madagascar* is described by Captain Owen (*i*) as formed of madreporitic rock, as likewise are the shores and outlying islands along an immense space of *Eastern Africa*, from a little north of the equator for 900 miles southward. Nothing can be more vague than the expression "madreporitic rock;" but at the same time it is, I think, scarcely possible to look at the chart of the linear islets, which rise to a greater height than can be accounted for by the growth of coral, in front of the coast from the equator to 2° S., without feeling convinced that a line of fringing reefs has been elevated at a period so recent, that no great changes have since taken place on the surface of this part of the globe. Some, also, of the higher islands of madreporitic rock on this coast, for instance Pemba, have very singular forms, which seem to show the combined effect of the

(*d*) Geolog. Transact. 2nd series, vol. i. p. 403. On the Peninsula of Malacca, in front of Pinang, 5° 30' N., Dr Ward collected some shells, which Dr Malcolmson informs me, although not compared with existing species, had a recent appearance. Dr Ward describes in this neighbourhood (Trans. Asiat. Soc. vol. xviii., part 2, p. 166) a single water-worn rock, with a conglomerate of sea shells at its base, situated six miles inland, which, according to the traditions of the natives, was once surrounded by the sea. Captain Low has also described (Ibid, Part i. p. 131) mounds of shells lying two miles inland on this line of coast.

(*e*) Notices of the East Indian Arch., Singapore, 1823, p. 6, and Append. p. 43.

(*f*) Captain B. Hall, voyage to Loo Choo, Append. pp. xxi. and xxv. Captain Beechey's Voyage p. 426.

(*g*) Travels in Ceylon, p. 13. This madreporitic formation is mentioned by M. Cordier in his report to the Institute, (May 4, 1839,) on the voyage of the Chevrette, as one of immense extent, and belonging to the latest tertiary period.

(*h*) Dr Benza, in his Journey through the N. Circars, (the Madras Lit. and Scient. Journ. vol. v.) has described a formation with recent freshwater and marine shells, occurring at the distance of three or four miles from the present shore. Dr Benza, in conversation with me, attributed their position to a rise of the land. Dr Malcolmson, however, (and there cannot be a higher authority on the geology of India) informs me that he suspects that these beds may have been formed by the mere action of the waves and currents accumulating sediment. From analogy I should much incline to Dr Benza's opinion.

(*i*) Owen's Africa, vol. ii. p. 37, for Madagascar; and for S. Africa, vol. i. pp. 412 and 426. Lieutenant Botelor's narrative contains fuller particulars regarding the coral-rock, vol. i. p. 174, and vol. ii, pp. 41 and 54. See also Ruschenberger's Voyage round the World, vol. i, p. 60.

Though the locality whence this supposed explosion is said to have occurred is at no great distance from the region of recently active volcanoes, Barren Island and the other chain of cones from Chittagong round, I have no doubt that it was one of those luminous appearances the sea so often presents betwixt Bombay and Aden, and more especially off the mouth of the Persian Gulf, so well described in our Transactions by Captain Kempthorne The following is the first account of this phenomena we possess, extracted from the Transactions of the Royal Asiatic Society:—

VIII.—*A remarkable Appearance in the Indian Seas; in a Letter from Lieutenant* DAWSON. *Communicated by* WILLIAM NEWNHAM, ESQ.

I beg leave to lay before the meeting an extract from the private journal of Lieutenant Henry Dawson, a very intelligent officer of the Royal Navy, at present employed on civil duties with the Indian Navy at Bombay, containing an account of a very extraordinary phenomenon, which was observed on the passage from Bombay to the Persian Gulf (the southern passage,) on board the Honourable Company's sloop of war *Clive*, in 1832. On my first going to India, I

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growth of coral round submerged banks, and their subsequent upheaval. Dr Allan informs me that he never observed any elevated organic remains on the *Seychelles*, which come under our fringed class.

"The nature of the formations round the shores of the *Red Sea*, as described by several authors, shows that the whole of this large area has been elevated within a very recent tertiary epoch. A part of this space in the appended map, is coloured blue, indicating the presence of barrier-reefs; on which circumstance I shall presently make some remarks. Ruppell (*j*) states that the tertiary formation, of which he has examined the organic remains, forms a fringe along the shores with a uniform height of from 30 to 40 feet, from the mouth of the Gulf of Suez to about Lat. 26°; but that south of 26°, the beds attain only the height of from 12 to 15 feet. This, however, can hardly be quite accurate; although possibly there may be a decrease in the elevation of the shores in the middle parts of the Red Sea, for Dr Malcolmson (as he informs me) collected from the cliffs of Camaran Island (Lat. 15° 30′ S.) shells and corals, apparently recent, at a height between 30 and 40 feet; and Mr Salt (Travels in Abyssinia) describes a similar formation a little southward on the opposite shore at Amphila. Moreover, near the mouth of the Gulf of Suez, although on the coast opposite to that on which Dr Ruppell says that the modern beds attain a height of only 30 to 40 feet, Mr Burton (*k*) found a deposit replete with existing species of shells, at the height of 200 feet. In an admirable series of drawings by Captain Moresby, I could see how continuously the cliff-bounded low plains of this formation extended with a nearly equable height, both on the eastern and western shores. The southern coast of Arabia seems to have been subjected to the same elevatory movement, for Dr Malcolmson found at Sahar low cliffs containing shells and corals, apparently of recent species.

"The *Persian Gulf abounds with* coral reefs; but as it is difficult to distinguish them from sand-banks in this shallow sea, I have coloured only some near the mouth; towards the head of the gulf Mr Ainsworth (*l*) says that the land is worn into terraces, and that the beds contain organic remains of existing forms. The *West Indian Archipelago* of "fringed" islands, alone remains to be mentioned: evidence of an elevation within a late tertiary epoch of nearly the whole of this great area, may be found in the works of almost all the naturalists who have visited it. I will give you some of the principal references in a note. (*m*)

"It is very remarkable, on reviewing these details, to observe in how many instances fringing-reefs round the shores, have coincided with the existence on the land of upraised organic remains, which seem, from evidence more or less satisfactory, to belong to a late tertiary period. It may, however, be objected, that similar proofs of elevation, perhaps, occur on the coasts coloured blue in our map: but this certainly is not the case with the few following and doubtful exceptions.

"The entire area of the Red Sea appears to have been upraised within a modern period."—Darwin on Coral Reefs, pp. 134–138.

(*j*) Ruppell, Reise in Abyssinien, Band i s. 141.

(*k*) Lyell's Principles of Geology, 5th edition, vol. iv. p. 25.

(*l*) Ainsworth's Assyria and Babylon, p. 217.

(*m*) On Florida and the north shores of the Gulf of Mexico, Roger's Report to Brit. Assoc. vol. iii. p. 14.—On the shores of Mexico, Humboldt, Polit. Essay on New Spain, vol. i. p. 62. (I have also some corroborative facts with respect to the shores of Mexico.)—Honduras and the Antilles, Lyell's Principles, 5th ed. vol. iv. p. 22.—Santa Cruz and Barbadoes, Prof. Hovey, Silliman's Journ. vol. xxxv. p. 74.—St. Domingo, Courrejolles, Jour. de Phys. tom. liv. p. 106.—Bahamas, United Service Journ. No. lxxi. pp. 218 and 221.—Jamaica, De la Beche. Geol. Man. p. 142.—Cuba, Taylor in London and Edinburgh Phil. Mag. vol. xi. p. 17. Dr Daubeny also at a meeting of Geolog. Soc. orally described some very modern beds lying on the N. W. parts of Cuba. I might have added many other less important references.

The investigation of the condition of the shores of the Red Sea is a subject on which I had very frequent occasion to allude before the Society: it is one for which we have peculiar advantages,

was in the habit of intimacy with the late Captain David Seton, who was many years resident at Muscat, and I well remember hearing him relate the circumstance of falling in with the *white sea*, described by Mr Dawson, on his occasional voyages to Muscat, during the period of the south-west monsoon.* So many years, however, have since elapsed, I am unable to give any more detail of the circumstance related by that officer, and merely here allude to it in proof of the phenomenon having been before observed. WILLIAM NEWNHAM.

During a passage from Bombay to the Persian Gulf, on board the Honourable Company's sloop *Clive*, on the 22nd of August, 1832, at a quarter before eight o'clock at night, a phenomenon appeared of the following nature, and to all on board, of an unheard-of-kind, which gave rise to transitory feelings of apprehension as to the vessel's contiguity to danger. Sailing under double-reefed top-sails and foresail, at the rate of nine and a half miles per hour, before a strong south-west monsoon wind, and a high sea, without any indication of a change in the elements, the ship was surrounded *instanter* by water as white as milk or snow; it seemed to have no termination until it reached an altitude of seventy-five or eighty degrees, where it subsided in a strongly marked ecliptic, above which the heavens presented a beautiful and bright blueish east, not dissimilar to polished steel. No line of horizon was visible; the dead white colour of the water close to the ship, as it increased in distance from her very gradually brightened, until, where I supposed the horizon to be, it assumed a silvery aspect, which, increasing as it ascended, became brilliant and dazzling towards the zenith, obscuring the stars and clouds which had before this visitation been distinctly visible. The sea in a moment became smooth; the ship, from rolling and labouring considerably, quite steady; no diminution in the wind occurred, but a sensation that it had fallen, even to a calm, was general, but momentary. The delusion was occasioned by the instantaneous steadiness of the vessel, as well as the cessation of the previous noise from the lashing of a mountainous and confused sea against the vessel's sides, and on her decks; her progress through the sea, however closely scrutinised, could not be observed; the disturbed water alongside and in her wake, as well as the foam around her bows, did not contrast with the adjoining unagitated fluid, notwithstanding, from the velocity of the ship through the water, these must have been considerable. Not a particle of phosphoric matter was once observable, either in the surrounding ocean, or in the water immediately displaced by the ship's passage through it; but when taken up in a bucket, and agitated with the hand, such was visible, but not in a greater proportion than is usual, nor did the water vary in appearance from common sea-water: nothing could be perceived to attribute this strange phenomenon to.

Animalcules of a minute kind were perceptible, as likewise a few pieces of a glutinous substance of a purple colour, but neither in any considerable quantity, nor differing from what is usually found in the seas of the Indian Ocean.

We sailed the distance of fifteen miles without the slightest change in the appearance of the sea or sky, when in a moment this extraordinary phenomenon vanished, the ship at the same instant encountering the like high and turbulent sea as previous to her envelopment.

The ship was not within one hundred miles of the eastern coast of Arabia, or of soundings, but sailing in what is termed deep ocean water.

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* Our subsequent inquiries serve to confirm this statement, inasmuch as few navigators appear to have passed along the eastern coast of Arabia, in the months of June, July, and August, without noticing the discolourment of the water (but *during the night only*), and which, on examination when brought on board, is said to exhibit no difference whatever from sea-water in other parts of the ocean.—EDITOR *Journal R. A. S.*

and which eminently concerns us—strange it is that it should so long have escaped us. As elsewhere stated, the whole Suez desert is covered with sea shells, apparently of recent origin, and reaching to the elevation of at least 800 feet. Dr Hoffmeister found them near Suez, at an altitude of 2000, and Dr Wilson still higher up in the peninsula of Mount Sinai. They are to be found in perfect preservation almost wholly isolated all over the lava peaks of Aden. I was at first disposed to imagine that they had been carried there by kites or crows, but found them afterwards, and learnt that they had been found by others, several feet under masses of volcanic ashes and sand. Aden bears no appearance of having been a submarine volcano—can we suppose that after it had been for a time in a state of activity it sunk under the surface of the ocean again to emerge to its present height? There have already been a long succession of elevations, interspersed by periods of comparative repose, and at times by those of actual subsidence. The formation of our coral reefs I consider due to the alternate depression or upheaval, indicated by the almost fresh mangrove roots and littoral concrete of Mahim wood and Sewree. I have no doubt but the views of Dr Malcolmson, justly stated by Mr Darwin as second to none as an authority in Indian geology, were in this case erroneous.

I have before mentioned that the ship was quite steady during her progress through the white water: this was the case, with the exception, that in a few instances she gave a heavy roll, as if influenced by a following swell; these were not more frequent than once in a quarter of an hour. Latitude 21° 40′ north, 59° 40′ east; thermometer 87°, barometer twenty-nine inches and nine-tenths.

The phenomenon I have attempted to describe appeared twice after we were first extricated from it, for periods of about twenty minutes; its brilliancy, as well as influence over the waves as previously described; the transition from high and mountainous seas to a smooth and seemingly quiet ocean, and change again to turbulence, was as sudden as a flash of lightning.

On my arrival at Muscat, a few days after, I endeavoured to gain some information on the foregoing matter, but beyond finding that the phenomenon was occasionally met during the strength of the south-west monsoon, about the limit noted, and that the water was then *quite fresh*, I could ascertain nothing satisfactory. My informants were the Nakodas, or captains of His Highness the Imam's ships of war, who frequently navigate between Muscat and Zanzibar, consequently must pass about the spot the Clive met what I have related. The Arab captains were firm in their assertion in the particular of the fresh water, although they confessed that they had never tasted it. I did, as also the surgeon of the vessel, and, as I mentioned before, it did not vary in any way from ordinary sea-water.—*Journal of the Royal Asiatic Society*, No. 9—page 198-200. H D.

The following is the extract from our Transactions in reference to the appearance seen in 1849, to which I refer:—

"*Moozuffer*, *25th January*, 1849.—I cannot permit this opportunity to pass by without describing to you, in the best way I am able, a most extraordinary phenomena which we all witnessed on the night of the 23rd instant. It would indeed require a far abler and more scientific pen than mine to do justice to it—however, I hope you will take the will for the deed, and pardon all imperfections. At 6·30 P. M. observed a very remarkable milky appearance in the water, the color assuming the same tint as a shallow mud-bank or sand-bank. The sea, which had a few minutes before been turbulent and confused, suddenly became smooth and placid, and the air felt cold and chilly. In the space of an hour the whole verge of the horizon, as far as the eye could reach, was most brilliantly illuminated. The vessel shortly after entered a vast body of water of the most dazzling brightness, and of a highly phosphorescent nature; in fact it looked as if we were sailing over a boundless plain of snow, or a sea of quicksilver. The surface of the ocean for miles in extent was unbroken—not a wave or ripple disturbed it, and the waters seemed so dense and solid, that the *Moozuffer* actually appeared as if she was forcing her way through molten lead. That part of the surface which was broken by the stroke of our huge paddle-wheels, resembled small patches of thick milk or cream. The sky, and everything around us, was quite lighted up by it. The weather was peculiarly fine, though the atmosphere was damp and moist: the wind was light from the N. W., stars over head clear and light, but those of a lesser altitude were rendered dim by a haze. The horizon nearly the whole time was dark, and ill-defined; a few thin cumulii, floating very low down, occasionally swept past; but no other peculiarity in the atmosphere could be perceived until about ten o'clock, when a singular light was seen in the heavens to the northward, as if day was dawning, or the full moon was either setting or just rising. It strongly resembled a faint Aurora Borealis, being of a roseate tinge near the horizon, and was a steady fixed light, but without those corruscations which are usually observed in the higher latitudes. It extended along the horizon in the form of a segment of a circle from N. W. to N. E., and the altitude of the centre of the arch was 15°. It continued visible until a few minutes after midnight, when it disappeared as suddenly as it appeared, and the sea about the same period lost also its luminous quality. The light in the heavens, and the lightness of the sea, were, however, again seen for about ten minutes at two A. M., when both became once more invisible. The horizon, except where the light appeared, was everywhere dark and indistinct, and could not be made out: the sky and sea were apparently blended together. The phenomena was altogether as beautiful as it was extraordinary. I could have stood on the deck gazing at it the whole night, and should not have felt fatigued. There was something grand and sublime in such a scene as I have faintly endeavoured to pourtray. No language of mine could ever do justice to it. We were upwards of six hours in passing through this vast body of luminous water, and during that time we ran a distance of upwards of forty miles. Our Lat. on first entering it was 16° 13′ S., and Long. 61° 54′ E., so that our position was exactly abreast of the entrance to the Persian Gulf, and in the fair channel to the Red Sea. From the fact of our having seen immense quantities of sea-weed floating past whilst in this luminous water, I should conclude the accumulation of this and other decayed matter, whether vegetable or animalculæ, was the sole cause of this phosphorescent appearance; and that all this matter might have been swept out of those narrow seas by strong currents, which meet no doubt about this spot: and I am still more inclined to believe this is the case, as a luminous stream of water has often been noticed nearly in the same Lat. and Long., and about the same season of the year. I saw it once in the *Victoria*, when I commanded her in the month of January 1842, whilst on our voyage from Aden to Bombay; but the sea was not nearly so bright then as this time. The color of the water so strongly resembled a shoal that I stopped the engines, and took several casts of the lead, but could get no bottom with 80 fathoms of line. Several buckets of water were drawn up by Dr Wilson, of the *Moozuffer*, but nothing whatever could be seen. It seemed as clear as crystal: on taking a bottle of it, however, in the dark, it became highly phosphorescent, giving out a strong light. It was full of animalculæ: some were in the shape of most minute globules of gelatinous substance, and others were not unlike small worms, about an inch in length, and about the size

of a fine hair. On removing the bottle to the light, the animalculæ became instantly invisible. The light seen in the heavens I cannot account for, unless it was the low fleecy clouds which hung on the verge of the horizon that reflected back the brightness of the sea; but why the whole sky should not have assumed the same appearance, I cannot imagine. It continued to shine in one spot only, and disappeared at the same time the sea lost its brilliancy. I send you an extract of the log in which the luminous appearance in the sea and heavens is noticed:—' At 6.30 P. M., passing through an illuminated sea: the sea also became suddenly smooth, with quantities of sea-weed floating by. At 10 an extraordinary luminous appearance to the northward, as that of a full moon rising or setting: the water of a thick white; with a very dark horizon: wind N. W.—hazy blue sky, with passing clouds.' "

Some months since I received from Dr Haines an account of this, as witnessed from on board the *Maria Soames* on her way from the Persian Gulf, Lat. 21° N., Long. 42° E. The phenomena are not only interesting in themselves but an account of them is valuable, as explaining the so-called seas of fire, seas of milk, and seas of blood, which we read or hear of, and regard as fancies of a heated imagination, or the baseless tales of travellers.

"In May 1840, when about one-third across from Aden to Bombay, the aspect of the sea suddenly changed upon us,—and at once seemed asif oil had been poured upon its surface. It was still as a millpond, and of a brownish soapy hue. The water on being examined was full of little fibrils—like horse-hair cut across, in lengths of the tenth of an inch or so. A wine-glass full of it contained hundreds of them. The accompanying diagram exhibits the aspect presented by them under the microscope. They were to all appearance spawn, or creatures of some sort in an embryotic state. I kept them for days, in hopes that they would develope themselves, and drew up fresh specimens of the water so long as it remained discoloured. But no symptoms of life were manifest, and decomposition speedily ensued. In the dark they were not luminous. We sailed through them for about five hours, so that they probably extended over a surface of 500 miles:—what myriads of living things were there! The officers of the ship told us that similar appearances were not unusual; and that one much more remarkable than this was sometimes to be observed, when the sea seemed for hundreds of square miles white and milky, so that it was at times difficult to believe that the vessel was not on the point of getting aground."

In all likelihood the luminous appearances in the sky described by Captain Kempthorne was merely the reflection by the clouds of the light from the sea.

In November the ship *John Line* came on a large sheet of discolored water in the Eastern seas, supposed to be a shoal: the following is an extract from her log, as well as from the log of the *Amazon*, in regard to a shoal in reference to which there could be no deceit:—

"November 19th, 1849.—At 3 P. M., suddenly came across a large patch of discolored water (ship at the time running 9½ knots with a heavy sea on.) Hauled out E. S. E. and ran along the Eastern edge until 2·15 P. M., when the edge trended off to the W. N. W. in a spite. The reef appeared to extend as far as was visible from the topsail yard, in a W. S. W. direction, and from four to five miles S. S. and N. N. W., and the current setting very strong to the Westward over it. There was apparently broken water on the S. E. spite. I had no soundings where the ship was, and it blew too fresh and with too high a sea running for me to lower a boat to sound on the reef, the edge of which was perfectly defined, from the deep blue of no soundings to a dirty green. When off the S. E. end, the Latitude was 12° 52′ N. and *Longitude by* mean of 3 Chro. 109° 46′ 17″ E.—Cape Varella W. by N. 15 miles, but not in sight from the thickness of the weather."—Extract from the Log of the *John Line*.

"H. M. Ship *Amazon*, Nov. 16th, 1849.—Sir,—I am much obliged for the information you gave me respecting the Rock you saw off Pedro Branco. I have made enquiries about it. I have ascertained that it escaped observation when the Straits were last surveyed, but it was discovered last year by the Government Surveyor when on the business of the Horsburgh Light House. The bearings were sent to the Admiralty, but the rock is not yet inserted in the charts. It is said to be dry at low water springs, but you saw it at low water neap tide. The following are Mr Thompson's (the Surveyor's) bearings - he took them on the rock at low water springs:—Pedro Branco S. 37° 30′ W. *one quarter of a mile*. Western South Rocks S. 19° W. Eastern do. do. S. 2° E.—I am, yours obliged, G. W. Thornbridge, Captain, H. M.'s Ship *Amazon*.—To Mr Poole, master of the Ship *Sophia Moffatt*."

The appearance described as seen from on board the *John Line* so closely resembles those already treated of, that I think we might almost hesitate admitting the certainty of the shoal until more proof of its existence reached us, considering that it must have been so often passed for a century or more without having hitherto been observed.

We have a variety of animalculæ which at certain seasons frequent our shores, imparting to the water in shallow pools, where they chiefly abound, the tint of blood: the exuviæ of this minute creature are found in abundance in the rock salt on the Indus and in the salt range. It tinges the back water surrounding our salt pans, the depth of the hue being considered a sign that the brine is strong enough for being run into the pan. Under a glass of moderate power they are seen in a state of great activity before the salt crystallizes: these once embedded in the salt seem on re-dissolving it to be motionless. On a recent voyage to Kurrachee I found off the shores of Kattiawar, where the general colour of the sea was of the deepest blue, large patches of the most intense red, apparently some fifty or sixty feet square – they looked like fresh drawn blood, as if some monster of the deep had just been slain there. We did not get near enough any of them to draw a bucket of water, but I have no doubt that they were occasioned by the same animalculæ which visit our shores. May it not have been from appearances such as these that the Red Sea has derived its name, rather than from its corals, to which it is ascribed, which are usually white, and seem greenish through the water, and are without a tint of red?

I must not here omit to note a curious incident which occurred at Porebunder on the 3rd November, of which the following account is given by a correspondent of the *Telegraph and Courier*: I am altogether unable to determine to what class of phenomena it is to be assigned:—

"Pore Bunder, *3rd November*, 1849.—We were visited with an epidemic amongst the fish a few days ago, caused, I think, by some sub-marine eruption of mud, mephitic gas, &c. The colour of the sea water on Saturday evening last, the 27th October, was changed from its usual tint to a deep red, omitting a most foul smell; the fish speedily were all destroyed, and were washed upon the beach in large quantities. The eruption must, I conclude, have been in the vicinity of the place, for many fish were taken alive, apparently stupified. The sea retained its peculiar color until the 1st instant. I hear that the epidemic extended upwards of 40 miles down the coast, and I am told that a similar phenomenon occurred three or four years ago, the natives attributing the death of the fish to a Star having fallen into the water. The Geographical Society would do well to examine into the affair. I think the idea of a submarine disturbance is much more rational than that of the falling star. I have no means of telling whether there was any atmospherical disturbance at the same time: we had, however, no sea breeze on the 28th or 29th, and the weather was on the whole, I fancy, clearer than is usual at this season. The tides also at the last full moon have receded much farther than I have ever seen during the last year. Have you a file of Cape papers at hand? Not long since a similar occurrence was experienced in Table Bay, and at the time, even such fish as were taken by hook produced disease amongst those who ate them. No such calamity, I am glad to say, has attended the incident here. It appeared quite a windfall to the poorer classes, who gathered up such as had not become decomposed, with great eagerness."

This state of matters extended, I am assured, at least forty miles out to sea; and while the native theory of the fall of a star is that which will least readily be admitted, I am at a loss what theory to adduce to account for the phenomenon.

While collecting and arranging observations bearing on the phenomena of regular and systematic occurrence, and of which we could not expect to be able to lay the full details before the world for a considerable time to come, it appeared to me that we might meanwhile, even in absence of regular records, proceed to collect and catalogue some of those more notable occurrences that obeyed no law that we were acquainted with, which were much too striking to have escaped observation, and which, from their very anomalousness, might, if gathered together in sufficient number, and examined with adequate care, afford the means of laying down the law yet awanting, or tracing them to the cause or circumstances to which their appearance was due. A catalogue of the more remarkable Hailstorms that have occurred in India within the last thirty years appears accordingly in the forthcoming number of your Transactions, and a catalogue of Hurricanes is in process of preparation. Captain Baird Smith has already brought down the list of our Earthquakes almost to the present time; and all that has in this matter been done is to preserve the most copious notes and references on the subject, to be placed at Captain Smith's disposal should he desire them, or to be made

use of for a continuation of his catalogue should he decline the task he has hitherto so ably performed. Notes of all the more remarkable tides of which accounts can be collected, have been made: these in their present state are of comparatively little value, though they may come to be of consequence when our regular series of tidal observations is ready for the press. As it is, our most notable tides are chiefly associated with hurricane phenomena, and as such are duly chronicled and disseminated by that indefatigable cyclonologist, Mr Piddington. In 1848, just as the details of the fall of some very extraordinary aërolites, with specimens of the mineral masses themselves, had been placed in our hands by Captain Wingate, Captain Fulljames, and the Revd. Mr. Reynolds, it was intimated to the British Association by Professor Baden Powell that he would be most thankful for any information that could be from any quarter sent him on the subject of luminous meteors; and the best mode of meeting his wishes and advancing this branch of science, seemed to be to prepare a catalogue of all the more notable meteors seen in India of which descriptions could be found—giving full and particular accounts in the newspapers of all seen at the presidency, in hopes that observers at outstations who might not otherwise have thought the matter worthy of attention, might send us particulars of all that they observed. Success in both these matters beyond the expectations of the most sanguine has attended exertion. A list of the meteors which have been observed in India before 1850, scarcely any of which have been set down in any regular catalogue, has been drawn up; while we have collected accounts of nearly all which have been observed and described within the past two years. These lists have already been before you, and are about to appear in the forthcoming number of your Transactions. I have for some time been endeavouring to make out a table of the fall of rain for a series of years at all the more notable localities in India, but find the documents on the subject so scattered, and the information in many cases so extremely scanty and imperfect, that I have not as yet made the progress in this I could have desired: in all things advance is most tardy, from the single-handedness of labour, even when, as in this case, the task is little more than one of marking and arranging extracts. There is no assistance to be looked for; and with the few short snatches of time a busy man can command, the progress made is deplorably tardy. We have been most anxious throughout to act on the principle laid down, if I mistake not, by Sir J. Herschell and Sir D. Brewster, to lay before the community on the spot as speedily as possible accounts of anything notable that occurred; and the beneficial results of this have at once manifested themselves in the multitude of returns that have been sent in. We have been able within the last two years to collect accounts of as many striking phenomena as the previous thirty supplied: not that the former have been a bit more fruitful than the latter, but in one case the fruit has been gathered and stored away, in the other it was suffered to fall to the ground and become useless, and then lost sight of.

For accounts of storms at sea we must often be indebted to vessels indifferently provided with instruments, and the best mode of making these available, such as they are, for the puposes of science, is to obtain and record careful ratings of them as often as possible. With this object in view, I have been in the habit of issuing circulars to the consignees or commanders of vessels in the port, requesting them to furnish me a note of the readings of their barometers and sympiesometers at ten and three A. M. and P. M., as well as an account of the character, and the name of the maker, of the instrument. To these I have received a large number of replies, though fewer than I could have desired; and as Mr Piddington states that a vessel sent to sea without a barometer or sympiesometer is no more seaworthy or deserving of being insured than if she were sent without spare rigging or pumps, I trust that before long some measures will be adopted of compelling returns such as those desired, that insurance offices and shippers may be on their guard. The instruments of which ratings have been received all seem good and

serviceable, and the officers to whom they belong to be sensible of their value. I hope to be able to accumulate more and more of these every year, and to publish from time to time a synopsis of results.

Meteorologists throughout India had for some time been engaged in examining the probable effects of vegetation and of moisture on climate, and the following results, mainly abridged from an able paper by Dr Balfour published in the Madras Literary Journal, gives a general outline of the present state of our knowledge on the subject—this bearing closely on one division of the Society's pursuits.

"The fall of rain at the elevations of 2000 to 4500 feet, on ridges exposed to currents of wind from the sea, amounts to about 200 inches annually: it decreases both as we ascend and as we proceed into the interior. Along the shores of Hindoostan it averages betwixt sixty and eighty—on the tolerably fertile or rarely-wooded portions of the great plateau it amounts to betwixt twenty and thirty-five. At Bellary it averages from ten to fifteen; and when we enquire the cause of this sudden diminishment, we find that the districts around are destitute of trees, and nearly devoid of all sorts of moisture or local vegetation. Humboldt, in noticing the barrenness and extreme aridity of the vast plains approaching the Oronocco from the Andes, Lat. 9°, states that the people assured him that the fall of rain had diminished within the last century, and that since the Spanish conquest the trees formerly abounding have been destroyed. The earlier settlers in Carraces are well known to have destroyed the climate by removing the trees; rain formerly abounded where now there is none. 'By felling the trees,' says Humboldt, as quoted by Balfour, 'that cover the tops and sides of the mountains, men in every climate prepare at once two calamities for future generations; the want of fuel, and a scarcity of water. Trees, by the nature of their perspiration and the radiation from their leaves in a sky without clouds, surround themselves with an atmosphere constantly cold and misty. They affect the copiousness of springs, not, as was long believed by a peculiar attraction for the vapors diffused through the air, but because, by sheltering the soil from the direct action of the sun, they diminish the evaporation of the water produced by rain. When forests are destroyed, as they are everywhere in America by the European planters with an imprudent precipitation, the springs are entirely dried up or become less abundant. The beds of the rivers remaining dry during a part of the year, are converted into torrents whenever great rains fall on the heights. The sward and moss disappearing with the brushwood from the sides of the mountains, the waters falling in rain are no longer impeded in their course; and instead of slowly augmenting the level of the rivers by progressive filtration, they furrow during heavy showers the sides of the hills, bear down the loosened soil, and form those sudden inundations that devastate the country. Hence it results that the destruction of forests, the want of permanent springs, and the existence of torrents, are three phenomena closely connected together.' Dr Duncan, of the Bombay medical establishment, mentions that within his own experience the climate at Dapoolie had been much more hot and dry—streams now dry up in December which used to flow till April or May: and this he attributes to the destruction of trees which formerly clothed the hills now left barren and desolate by their removal. In the Southern Concan, within the space of fifteen years the climate has been greatly deteriorated by the diminution of vegetation, and consequently of rain. The people of Pinang have memorialised Government against the destruction of their forests, sure that the result of its continuance will be the ruin of the climate. The dreadful droughts which now so frequently visit the Cape de Verd Islands is avowedly due to the removal of their forests; in the highlands of Greece, where trees have been cut down, springs have disappeared. The excessive rains around Rio Janeiro have been modified and reduced by the diminution of the woods. The valley of Aragua, in South America, affords a curious series of examples of diminution of rain by the destruction of trees, and encrease of fall by their multiplication. The valley is completely enclosed by high ranges of hills, giving rise to various stream

and rivulets, the waters of which form a lake at the extreme end of the valley. The lake has no exit, and its superfluous waters are carried off by evaporation. Betwixt 1555, when it was described by Oviedo, and 1800, when it was visited by Humboldt, the lake had sunk five or six feet, and had receded several miles from its former shores, the portion of the basin thus left dry appearing the most fertile land in the neighbourhood. This is ascribed, by the distinguished traveller just named, to the destruction of the trees on the mountains. When the war of liberation broke out, agriculture was neglected, and the wood from the hills was no longer required by human industry—a great jungle began to prevail over all. The result was, that within twenty years not only had the lake ceased to subside, but began once more to rise, and threaten the country with general inundation. This is only a single case out of many of precisely similar nature with which South America supplies us. We have had repeated occasion to allude to the diminution of rain in Oudh, which the older inhabitants compare to the retiring of the tide, so manifest and gradual it is. In Switzerland it has been perfectly ascertained that rivulets formerly full have shrunk or dried up coincidently with the denudation of the mountains, and that they have once more returned to their former size on the woods being restored. A beautiful spring, situated at the foot of a woody mountain in the island of Ascension, was observed to diminish in flow as the trees were cut down, and to vanish altogether when the wood disappeared. After a few years, during which no water flowed, the mountain became wooded again; when the stream once more began to flow, and as the vegetation encreased returned to its former size. The destruction of wood, though at all times followed by a diminution in the flow of running water, is not invariably attended by a decrease in the fall of rain. Marmato, in the province of Popagan, is situated in the midst of enormous forests, and in the vicinnage of valuable mines. The amount of the discharge of the streams here accurately measured by the work performed by the stamping machines which they drive, was observed to decrease steadily as the wood was cut down; within the space of two years from the commencement of the clearing the decrease of the flow of water had occasioned alarm. The clearing was now suspended, and the diminution ceased.—A rain-gauge was now established, when it appeared that the fall of rain had not diminished concomitantly with the flow of the streams. The apparent anomaly here presented, does not affect the general doctrine, and is easily explained. The clearings were too local to affect the general condition of the climate: the rain which fell, however, instead of percolating as was its wont, through the soil, when shaded by trees, producing springs, rivulets, and brooks, now dried up, and was carried off in vapour as it fell. India, in nearly all these things, furnishes precise parallels to South America. A few years since a proprietor, in laying down some ground well watered by an excellent spring, for a coffee garden at Glenmore, in the Salem district, despite the advice of the natives cleared the ground, when the supply of water vanished. At the village of Hoolbulley, near the head of the new ghaut in Munjerabad, the jungle was cleared away, and in every case the diminution of water followed almost immediately,—in some cases the coffee plants dying in consequence: the jungle was allowed to grow again, when water returned, the springs were opened, and the rivulets and streams flowed afresh as formerly. Around Ahmednuggur, springs shaded by trees have invariably been observed to dry up almost immediately on the trees being removed. Having seen the result of the destruction of trees in diminishing the fall of rain, we come now to the converse state of matters, so as to establish the proposition by both varieties of proof. Unfortunately our evidences on this side of the question are much less numerous than those on the other, though equally uniform and pertinent: the propensity to remove or destroy being much more prevalent and active than to establish forests. The St. Helena Almanac for 1848 gives particulars of the encrease of the fall of rain within the last few years, attributable to the encrease of wood: within the present century the fall has nearly doubled. The planta-

tions seem to have performed another service to the island. Formerly heavy floods, caused by sudden torrents of rain, were almost periodical, and frequently very destructive: for the last nine years they have been unknown. On the mountains of Ferro, one of the Canary Islands, there are trees each of which is constantly surrounded by a cloud: their power of drawing down moisture is well known to the people: the natives call them *garol*, the Spaniards *santo*, from their utility. The drops trickle down the stem in one unceasing stream, and are collected in reservoirs constructed for their reception. Thousands of similar instances might be quoted: our own revenue surveyors, indeed, could supply an almost unlimited amount of information bearing on the same subject. The whole of this beautiful process depends on the simple laws of temperature, evaporation, and condensation. Trees shade the soil from the sun—they give off vapour during the day, and so mitigate heat while they obstruct the direct rays from above: they radiate out heat during the night, and occasion the precipitation of dew,—many plants being endued with this faculty to such an extent as to collect water in large quantities from the air. The total quantity of dew believed to fall in England is supposed to amount to five inches annually—and the estimate appears to us to be a vast way under the truth: the average fall of rain is about twenty-five inches. Mr Glaisher states the amount of evaporation at Greenwich to have amounted to five feet annually for the past five years, and supposes three feet about the mean evaporation all over the world: on this assumption the quantity of actual moisture raised in the shape of vapour from the surface of the sea alone amounts to no less than sixty thousand cubic miles annually; or nearly 164 miles a day. According to the observations of Mr Laidlay, the evaporation at Calcutta is about fifteen feet annually; that between the Cape and Calcutta averages in October and November nearly three quarters of an inch daily,—betwixt 10° and 20°, in the Bay of Bengal, it was found to exceed an inch daily. Supposing this to be double the average throughout the year, we shall, instead of three, have eighteen feet of evaporation annually; or were this state of matters to prevail all over the world, an amount of three hundred and sixty thousand cubic miles of water raised in vapour from the ocean alone!"

I have in this report departed from the custom in former years pursued of confining myself to an abstract of the geographical information laid before us, or an account of the surveys, voyages or journeys of discovery in progress during the currency of the year, because during former years the Society was merely a passive recipient not an active collector of information: my indefatigable and deeply lamented predecessor not having been spared long enough to work out the schemes he had planned in 1833, and the surveys in progress from 1836, when we first began to publish our Transactions, to 1842, when he was removed from us, being sufficiently fruitful and numerous to supply matter for a report. I have elsewhere stated that there had been during the past eighteen months scarcely any surveys in progress; this is not to be received as strictly correct,—but of those which are so, no particulars have as yet reached us, so that betwixt non-existing and non-reporting survey officers the difference to us is next to nothing. Our ignorance in these matters may

probably be enlightened by another year, and the history of the enquiries in progress throughout the past season afford matter for the next season's report. It has seemed to me, meanwhile, that it might not be amiss to make members aware of what we were about, by throwing together, in the shape of narrative, an account of the progress of our undertakings in so far as these are in a position to be narrated, and to intersperse in this a multitude of detached facts, some of which have recently, many of which have long ago, been given to the world, in so far as they bear on our researches,—most of them being dispersed in a multitude of different and sometimes of not very accessible repositories, none of them having hitherto been given in a connected or systematic form, or as bearing on any particular doctrine. In doing so I have only been endeavouring to fulfil a portion of the task I have stated as so important—of revising and reviewing the labours of the past, and endeavouring to place so many of these as were collocable in harmony and order beside each other.

The two great discoveries in these latitudes during the year are the Snowy Mountains in Western Africa and the Great Central Lake to the South. It is now little more than a year since Dr Beke got ridiculed by the distinguished geographer Mr Cooley for endeavouring to show, on the authority of Mr Rebmann, that there was nearly under the equator in Eastern Africa a range of mountains, the highest of which was Killimandjaro, which rose to considerably within the line of perpetual congelation, attaining an altitude of not less than 20,000 feet. The missionary persevered in his argument, and was backed by authorities from the Cape; and we have now before us proof positive of the existence not only of one but of many such mountains, rivalling the loftiest of the Andes in elevation, and probably not falling greatly behind them in mass. In No. 6, Vol. III., of the *Bombay Church Missionary Record*, just published, we find letters from Dr Krapf minutely describing these stupendous chains, which he speaks of having nearly approached. He himself saw the Kenia—it extended a great way from east to west and by north. From the general mass two mighty peaks, covered with perpetual snow, towered up into the sky: they seemed much loftier than Kilimandjaro, though whether they were so actually or only in appearance from vicinage, does not appear: the former is the more probable assumption, the higher mountain being apparently the nearest of the group. From this Dr Krapf supposes, and apparently with much reason, the principal branch of the Nile takes its rise. The snowy range seems scarcely a fortnight's journey from the shore, and is little more than this much from us,—so that within a month's journey of Bombay, famed as it has long been for the researches of its geographers, lies unexplored and neglected one of the most accessible and most wonderful fields of geographical research the world contains:—a snowy range under the line,—the source, in all likelihood, of the great feeders of the Nile on the north, of the system of rivers which supply the great African Lake on the south, and not improbably of the Niger and other mysterious streams which lose themselves in the western deserts, or find their way into the Atlantic.

A distinguished member of our Society, the late Sir W. Harris, so far back as 1835 addressed us on the subject of the Great African Lake, the existence

of which had then been ascertained through the enquiries of the Missionaries. Sir William was most anxious to have gone himself in quest of it if provided with a companion, and he strongly recommended Captain Fulljames as the party fittest for the journey. The matter fell aside, and the very existence of the Lake became disbelieved, and the indications of it were displaced from our maps; when a band of adventurers, one of them from India, ten months since reached its shores. The following is the account of it laid before the Royal Geographical Society on the 11th February last—it gives all the information we possess regarding it :—

"Papers read were.—1. 'Account of the Discovery of the Lake Ngami, in Southern Africa, by the Reverend David Livingston, accompanied by Messrs Murray and Oswell.' Mr Livingston, with his friends, started on the 1st of June last from Kolobeng (25° S. lat. and 26° E. long. South Africa) to penetrate the Desert in search of the Lake. This desert has hitherto presented an insurmountable barrier to Europeans; and a party of Griquas even last year, at two different points, made many and persevering efforts in vain to cross it. When Sekomo, the Bermangueto chief, learned the intention of Mr Livingston to penetrate through the region beyond him, he ordered his men to drive the Bushmen and Bakalihari from the route, in order to deprive the party of their assistance in search for water. After a persevering march of about 300 miles, the party at length struck on a magnificent river on the 4th of July; and, following along the banks of this nearly 300 miles more, reached the Batasama, on the Lake Ngami, in the beginning of August. The Bakoba, or Bayeige, are a totally distinct race from the Bechuanas, and are much darker than the latter. Of 300 words collected by Mr Livingston, only twenty-one appeared to resemble the Sitchuana. 'We greatly admired,' says Mr Livingston, 'the frank, manly bearing of these inland sailors; who paddle along their river and lake in canoes hollowed out of the trunks of immense trees, take fish in nets made of a weed abounding on the banks, and kill hippopotami with harpoons attached to ropes.' The banks were beautiful in the extreme, in some parts resembling the Clyde. They were covered with gigantic trees, many of them quite new. Two or three measured in circumference seventy to seventy-six feet. The higher the party ascended the river the broader it became, until it measured upwards of 100 yards in breadth between the wide belt of reeds lining the sides. The water was, clear as crystal, soft and cold. The Youga is reported to communicate not only with the lake, but also with other large rivers coming from the north. One remarkable feature of the river is its periodical rise and fall. During the short time the party remained, it rose nearly three feet in height, and this too in the dry season. This rise is evidently not caused by rain, the water being so pure; and besides the purity increased as the party ascended towards its junction with Tamunakle, from which river it receives a large supply. With the periodical rise of the rivers large shoals of fish descend. The latitude of the lake at its north-east extremity is 20° 20',—the longitude is supposed by Mr Livingston to be about 24° east. It gradually widens out from the mouth of the Youga into a frith about fifteen miles across, and towards the south-west presents a large horizon of water."

Our brethren of the Asiatic Society have been favored with a most valuable survey of one of the most singular localities in the world—that on which the Mud Volcanoes near Beila prevail. The only account of these hitherto published is to be found in our Transactions for 1839: the following is an outline of the notice:—

"Scinde, which had first become partially known to us through the writings of Pottinger, McMurdo, and the two Burneses, was up to 1838 notwithstanding this comparatively an unknown land to us. When a British army first set foot on its shores we had a whole division of travellers out in every direction, and a whole host of papers, many of them of the greatest interest and value: the apathy manifested in reference to the physical geography of Scinde since it became our own, contrasts most strangely with our inquisitiveness while it remained the dominions of the Ameers; and enquiries seem to have been almost altogether dispelled ever since the time when they could be pursued with safety and advantage. Captain S. V. W. Hart, of the 2nd Grenadiers, our present much-respected paymaster of pensioners, was at this time one of the most active of those in quest of information and adventure in Scinde. In the beginning of 1839 he determined to proceed from Kurrachee into the regions to the northward, to visit the celebrated temple of Hingaly, situated about twelve miles from the sea at the extremity of the great chain of mountains which separates the province of Las from Mekran. The account of the pilgrimage is most interesting, but the title

of the paper gives no intimation of the fact that the information it contains is infinitely more valuable than anything that can be said of a temple or a pilgrimage ; and to this omission can alone be ascribed the comparative neglect the account of the mud volcanoes has experienced. Had it been otherwise, they must ere now have attracted the attention of geographers ; yet we find no allusion made to them even in the latest editions of the works of the all-observing and indefatigable Lyel, which have since 1839 made their appearance, though scarcely a single fact to be found in print bearing on his pursuits appears to escape his notice. Within two days' sail of the port of Kurrachee, within a hundred yards of the sea, commences the group of mud volcanoes known by the name of the Koops of Rajah Rama Chandra. Three of these were visited by Captain Hart—a fourth was seen by him at a distance ; and they are said to be very numerous, and to extend some way along shore, and far into the interior. About two miles from the wells of Tilook Pooree, three hills, of extremely light-coloured earth, rise abruptly from the plain.

MUD VOLCANOES—FROM A SKETCH BY CAPTAIN HART.

" The centre hill is conical, slightly flattened, and divided at the top: it is about 400 feet high : its southern and western sides are more precipitous than the others. The second of the group is about half the height of the first,—the two are connected by a causeway about fifty yards in length. The third covers a greater area than either : its apex seems destroyed or broken off, otherwise the characteristics of the three closely resemble each other. They are all indented at the base with numerous chasms and fissures, which run into the interior; and their sides are stroked from the summit down as if with sluices of mud or water overflowing from the crater. A basin of liquid mud about thirty yards in diameter occupies the whole summit of the largest of the three. Air bubbles and jets of mud arise from the basin constantly—the semi-fluid mass within being constantly disturbed by them. They are said to be larger in size, and of more frequent occurrence, on Monday than on the other days of the week—then alone overflowing the lip of the crater. The whole summit of the hill is crusted over with caked mud. The same appearances almost exactly are presented by the craters of the two other hills,—with this difference—that in the case of one of them the mud was said to rise and fall, occasionally overflowing the crater, sometimes sinking in it above 150 feet. A fourth hill, similar to those just described, was seen at some six miles off, but was not visited. The water and mud all round is salt—the ground at the base of the hills is full of cracks and rents. It is the same volcanic agency most probably which gives rise to the hot springs of Muggur Peer, betwixt Kurrachee and Sonmeanee, which supplies the famous crocodile tank, and which feeds or stimulates the mud volcanoes. Abundance of brimstone is found at no great distance, and one eminence some twelve miles off is known by the name of the sulphur mountain. The hills between Lheree and Beila are said to abound in copper, and from near Sonmeanee we have received beautiful specimens both of the sulphuret and carbonate of lead. The native tradition regarding

them is, that after the abduction of the Goddess Seeta by Rawun, Sedashew, a form of Mahadeo, was, amongst others, occupied in endeavouring to discover the place of her concealment. For twelve years he prosecuted his search uneasingly, but without effect. Worn out with exertion, and enraged at the fruitlessness of the task he had imposed on himself, he dashed his sacred cake on the ground. It broke into eighteen pieces, and from every fragment a koop arose. The Goddess instantly appeared, and chid his wrath and impieties, assuring him that throughout his wanderings she had accompanied him in the shape of a fly, which generally sat on his holy cake. In commemoration of his exertions on her behalf, she ordered that every pilgrim should pay his devotions to one of the koops before visiting her temple. The koops are called by the name of her husband Rama Chandra. On nearing the crater, the holy man who precedes the pilgrims continually cries out, Speak, oh Rama Chandra!—and to their astonishment, accordingly, they find on their arrival the mud at the top in a state of commotion,—evidence to them sufficient that the invocation has been listened to, and the deity is present."

It is to be hoped that the whole of the region of Mud Volcanoes will speedily be explored and described by our surveyors with a minuteness and care even greater than Captain Hart, who has last described them, and whose description is just about to be published, could bestow.

I have not touched on the progress of geographical research on the Northwest Frontier of India, or on the researches and discoveries of Drs. Campbell, Hooker, and others: the splendid emporium for the knowledge collected in Bengal—the Transactions of the Calcutta Society—affords attractions for all the information from these parts to itself.

On one subject I must touch before concluding—it is as singular as it is a painful one. It would seem almost incredible were it not true, that the Government of England stands in the way to prevent the dissemination throughout Europe of the stores of information the Transactions of our Indian Societies contain, and on which so much labour and expense has been bestowed, and that it finds its way with difficulty into the scientific circles at home by reason of the Custom-House regulations. Our books, printed for the general good, and given away free of charge, cost us so much trouble in getting them sent home, that few are sent at all. We find some of the ablest men of science in England as ignorant of what is going on in India as if we were all asleep. An admirable work on Meteorology lately published derives its facts as to our climate from Humboldt, and ignores the most striking and remarkable of our phenomena: kunkur and laterite, the great characteristic formations of India, are not to be found so much as noticed by any of our English geologists: yet we offer our Transactions freely to every library and every man of science that will accept of them. While the Peninsular and Oriental Steam Navigation Company carries papers, instruments, and works for the advancement of science, free of charge all over the world, the Lords of the Treasury for a paltry fraction of not one thousandth part the sum they sacrifice, virtually shut us out

from our native country. The grievance has often been represented—it is one from which we all equally suffer, but hitherto our representations have been in vain.

The following is an abstract of the accounts of the Society for the past year :—

Annual Statement of Receipts and Disbursements of the Bombay Geographical Society, from 1st May 1849 to 30th April 1850.

Disbursements.	Rs.	Rs.	As.	Pie.
April 30th, 1850.				
To Office Establishment...	600			
To Amount allowed as gratuity to the old Purvoe.....	160	760	0	0
To Printing and Advertisements.....		750	9	9
To Government on account of Tidal and Meteorological Observations.....		613	11	11
To Books purchased.....		28	2	2
To Philosophical Instruments purchased for sale.....		1772	6	1
To Contingent expences...		593	6	6
To Treasurers' Commission on payments up to the 31st July 1849, Rs. 2540: 1 : 10 at 1 rupee per cent...		25	6	5
To Balance, viz...				
In the hands of the Treasurers on the 30th April 1849 as per last year's statement,.....	3203 2 0			
Sums at Credit during the year...	1011 11 11			
Total.....	4214 13 11			
Deduct.				
Sums at debit during the year...	3408 11 8			
Balance in the hands of the Treasurers.....	806 2 3			
Ditto in the hands of the Secretary.....	28 5 9	834	8	0
Grand Total...		5637	15	10

Receipts.	Rs.	Rs.	As.	Pie.
April 30th, 1849.				
By Balance in the hands of the Treasurers as per last year's statement.	3203 2 0			
By ditto in the hands of the Secretary....	9 4 11	3212	6	11
April 30th, 1850.				
By Government grant at 50 rupees per mensem...		600	0	0
By Annual subscriptions of Members.		1219	0	0
By General Paymaster, being the amount received on account of Schedules supplied to Government...		80	0	0
By Military Paymaster, being the amount refunded by Government on account of a Barometer...		67	7	0
By Printed Society's Transactions sold.....		125	10	0
By Printed Royal Geographical Society's Transactions sold.....		20	0	0
By Admiralty Manual.....		20	0	0
By Ross Testimonial.....		5	0	0
By Interest allowed by Messrs Remington and Co., Treasurers, as per their statement...		139	15	11
By Philosophical Instruments, on account of, from different gentlemen..... ...		139	7	0
Grand Total...		5637	15	10

Bombay Geographical Society's Rooms,
Town Hall, 1st May, 1850.

Errors Excepted.
(Signed) GEORGE BUIST,
Secretary to the Society.

Examined and found correct.
Bombay, 13th June, 1850.
(Signed) H. J. BARR, *Chairman.*
" JOHN SMITH. } *Auditors.*
" JAMES HOLLAND. }
" S. S. DICKINSON. }

(Signed.) GEORGE BUIST.

It was proposed by Major P. T. French, and seconded by T. J. A. Scott, Esq.—"That the report now read by the Secretary, be adopted by the Society, and that their cordial thanks be offered to him for his unremitting zeal."

An abstract of the votes for the office-bearers for next year, having been made, the following gentlemen appeared to have been chosen as members of the Managing Committee by a majority of votes in their favour on the printed lists.

Vice-Presidents.

1. Commodore S. Lushington, I. N.
2. Colonel P. M. Melvill.
3. Captain J. C. Hawkins, I. N.

Members.

Resident Members.

1. Major J. Holland.
2. Dr C. Morehead.
3. Commander R. Ethersey, I. N.
4. Captain H. J. Barr.
5. Commander G. Jenkins, I. N.
6. Professor J. Patton.
7. Colonel George Moore.
8. C. J. Erskine, Esq.
9. Colonel N. Campbell.
10. S. S. Dickinson, Esq.
11. The Hon'ble D. A. Blane, Esq.
12. Henry Cormack, Esq.

Non-Resident Members.

1. Major G. LeGrand Jacob, Sawunt Warree.
2. Captain G. Fulljames, Ahmedabad.
3. R. K. Pringle, Esq., Kurrachee.
4. Capt. E. P. Delhoste, Phoonda Ghat.
5. Maj. H. C. Rawlinson, Bagdad.
6. Capt. P. T. French, Baroda.
7. Dr. E. Impey, Indore.
8. Lieut. C. J. Cruttenden, I. N., Aden.

The following books and letters &c. were laid on the table :—the papers were directed to be referred to the Committee on papers—the accounts to that on finance.

Letters.—From J. G. Lumsden, Esquire, Secretary to Government, requesting the Society's acceptance of a copy of each of the 12th and 2nd numbers of volumes three and four of the Journal of the Indian Archipelago and Eastern Asia, dated 30th April, No. 1730.

From P. R. Pires, a memorandum on the subject of translating two Portuguese works of Conto and Barros, with an offer to undertake the task if the Geographical Society would be disposed to support.

From J. G. Lumsden, Esquire, Secretary to Government, in the General Department, dated 20th April last, informing that the Right Honorable the Governor in Council is pleased to subscribe for 150 copies of the Manual of Scientific Observations referred to in the Society's letter (No. 27) dated 8th April.

From Commander G. Jenkins, I. N., dated 22nd April, transmitting copy of a letter addressed by him to the Editor of the *Telegraph and Courier* newspaper.

From H. E. Goldsmid, Esq., Secretary to Government, Political Department, dated 23rd April, No. 1904, of 1850, forwarding copy of the Guzrattee Version of the Prize Essay on Infanticide, "prepared by Cooverjee Rustomjee, Modee," late an Assistant Teacher in the Elphinstone Institution, at this presidency.

From T. Holcroft, Esquire, acknowledging the Society's letter, and requesting to be furnished with a copy of the printed regulations of the Society.

From J. J. Franklin, Esquire, Secretary Marine Board, dated 26th April last, No. 688, forwarding Meteorological Registers kept at Cuddalore and Cocanada, which last place is about ten miles north of Coringa.

From N. A. Dalzell, Esquire, Assistant Collector of Customs, acknowledging receipt of the Society's letters describing the Anemometer, and stating that it cannot be set up at Vingorla.

From Captain E. P. DelHoste, dated Dajeegar, May 7th, instant, requesting to take out his name from the list of the subscribers to the Society.

From Captain W. Strange, Nizam's Cavalry, requesting to be supplied with an Aneroid Barometer and some instructions for its use, forwarding a register.

From Dr Scott, Secretary to the Medical Board, dated 14th inst., stating that if a returning Indent for the Instruments which the Society desire to return into the Medical Stores, be supplied, the Medical Board will sanction it, and so in all future cases.

From Major LeGrand Jacob, requesting information whether the Geographical Society can spare instruments for the use of Sub-Assistant Surgeon Spencer, viz. a Barometer and Thermometer.

Books.—Presented by Government.—Journal of the Indian Archipelago, vols. III. and IV., No. 2nd and 12th, with a letter from J. G. Lumsden, Esquire, Secretary to Government in the General Department.

A Goozerattee translation of the Prize Essay on Infanticide, by Cooverjee Rustomjee Modee, —presented by Government, with a letter from H. E. Goldsmid, Esquire, Secretary to Government, Political Department.

Papers.—From Mr Mayes, Aden, through Captain Haines,—Tidal and Meteorological Observations for the month of March, 1850.

From the Marine Board, Madras,—Meteorological Register kept at Cuddalore and Cocanada.

Rough Notes on the Geology of the country between Saugor and Gwalior, with slight notices of other natural and artificial objects.

Rough notes during a trip from Bushire to Shiraz, and back, in July 1849, by Mr W. H. Litchfield.

Commander Jenkins gave notice of a motion to be brought forward next meeting, that the revised Regulations of the Society, which were incorrectly given in the Almanacs, should be reprinted—each member of the Society receiving a copy.

The Hon'ble Mr. Willoughby proposed Mr. Spens, Chief Magistrate of Police, as a Member, to be balloted for next meeting.

Proposed by Commander Jenkins, seconded by John Ritchie, Esq.—

"That the thanks of the Society be given to the Hon. J. P. Willoughby, Esq., for his very able conduct in the chair."

ERRATA.

HAVING reason to wish the dispatch of some copies of the foregoing Report home by the steamer of the 25th July, it was passed much more rapidly through the press than consisted with accuracy, and a considerable number of typographical errors have, in consequence, crept in. The reader is requested to correct the following:—

Page liii, line 3, from the bottom.—For *decision* read discussion.
Page lxv, line 8, from the bottom.—For *unfortunately* read uniformly.
Page lxvii, first line.—For *end of May* read middle of May. The second sentence in the second paragraph ought to read thus: "If it be impossible to get barometers of the very best construction and quality, where the mercury is lowered half an inch or so each reading below its proper position and then restored to the fiducial point so as to get quit of all risks of adhesion, *to* differ from each other when hung up side by side *less* than ·030, or as much as would correspond to thirty feet of altitude, it is surely idle to speak of the coincidence of the barometer and theodolite to within four or five feet as *other* than the result of more than an accident." The *to* in italics is left out, and *less* is printed *more*, in the text.
Page lxxvii, line 8 from the top.—For *no* objection read an objection.
Page lxxviii, line 20 from the bottom.—For *extensive* papers read excellent papers.
Page lxxxvi, end of middle para.—For "the amount of evaporation which occurs at low temperatures everywhere in the open ocean at all times &c.," read "the amount of evaporation which occurs at low temperatures everywhere, and *in* the open ocean at all times" &c.
Page xci, line 2 of the second para.—For "A downward or upward movement &c." read "A downward and then an upward movement &c."
Page xci, line 6 from the bottom.—Put in a full point after submerged, and begin the new sentence with the word from.
Page xcii, line 11 from the bottom.—For *one* curious fact read *a* curious fact.
Page „ line 8 from the bottom.—For in situate read *in situ*.
Page „ line 6 from the bottom.—For from its *present* rock read from its *parent* rock.
Page „ line 2 from the bottom.—For more *extreme* prevalence read more *extensive* prevalence.
Page xcvi, line 7 from the top.—For *irruption* read *eruption*.
Page „ line 8 from the top.—For *intimation* read *alteration*.
Page xcviii, line 5 from the bottom.—For *interspersed* read *interrupted*.
Page cix, line 18 from the top.—For Captain Hart read Captain Robertson.

THE Ordinary Monthly Meeting of the Bombay Geographical Society was held in their Rooms, Town Hall, on Thursday the 13th June 1850. Present:—The Hon'ble J. P. Willoughby, Esq., President in the Chair; Colonel George Moore, Dr B. White, Norman Oliver, Esq., Professor Joseph Patton, T. J. A. Scott, Esq., Venaikrow Juggonathjee, Esq., John Ritchie, Esq., and Dhunjeebhoy Framjee, Esq.

The Minutes of the last Meeting were read and approved of.

Mr Spens, proposed by the Hon'ble J. P. Willoughby, and seconded by Norman Oliver, Esq, was duly elected by ballot.

The following proposition of Commander G. Jenkins, I. N., was read:—

"That the Revised Regulations of the Society, which were incorrectly given in the Almanacs, should be reprinted, each member of the Society receiving a copy."

Mr N. Oliver said he begged to put the motion therein contained for Commander Jenkins.

The Hon'ble Mr Willoughby, with reference to Mr Oliver's motion, asked where the Revised Regulations, proposed to be published, were to be seen. He said that he believed the regulations had as yet to be revised, and that a Com-

mittee had better be appointed to do so.—After some conversation on the subject, Mr Oliver withdrew the motion, and the consideration of the subject was postponed till next meeting.

Lieut. J. H. Raverty was proposed as a Member by the Hon'ble Mr Willoughby, and seconded by Colonel G. Moore, to be balloted for next meeting.

The Audited Accounts of the Society being laid before the meeting, were approved of.

The following letters, papers, and books, were then laid on the table :—

LETTERS.—From J. J. Franklin, Esquire, Secretary to the Marine Board, No. 757, dated 10th May 1850, forwarding Meteorological Registers kept at Cuddalore and Cocanada, during the month of April last.

From J. G. Lumsden, Esquire, Secretary to Government in the General Department, No. 2078 of 1850, dated the 24th May last, requesting the Society's acceptance of a copy of the March Number of the Journal of the Indian Archipelago and Eastern Asia.

From J. R. Hadow, Esquire, dated 23rd May last, requesting to take off his name from the list of subscribers to the Society.

From Thomas Bell, Esquire, Secretary to the Royal Society of London, dated 20th March 1850, expressing the Society's thanks for Transactions of the Bombay Geographical Society, from October 1848 to May 1849, and assuring that the Royal Society duly appreciated this mark of consideration.

From Commander C. W. Montriou, I. N., No. 32 of 1850, dated 27th May last, forwarding a parcel and a letter, which were enclosed in a package of books for the Observatory, sent by last mail from England.

From Captain W. G. Hebbert, dated Poona, 27th May last, informing that he received his Mountain Barometer and a pair of Thermometers in good condition, and requesting some information on the subject of regulating them.

From Commander G. Jenkins, I. N., forwarding a Cheque which he received from Madras, being the subscription of the Right Hon'ble Sir Henry Pottinger and Dr Woosnam, to the Testimonial in honor of the late Captain D. Ross, I. N.

From Manockjee Nusserwanjee, Esquire, dated 28th May last, requesting to take off his name from the list of subscribers to the Society.

From Major Grant, Agent for Gun-carriages, forwarding a bill in duplicate, and requesting to pay the account into the Military Pay Office, and to return the same with the Pay-master's receipts thereon.

From Messrs Smith, Elder and Co., dated London 6th May 1850, acknowledging receipt of Secretary's letter of the 16th March last, and its accompaniment, being a bill at sight for £21 5s. 1d. in liquidation of their account as rendered by them to the close of last year, and informing that the same has been placed to the Society's credit.

From Dr John Bean, Assistant-Surgeon 1st Fusiliers, dated Poona, 5th instant, requesting to be supplied with certain instruments therein enumerated, and a copy of Scientific Manual.

From E. Roberts, Esquire, dated Surat, 7th instant, acknowledging receipt of the Secretary's letter and a bill, together with a Mountain Barometer and a pair of common Thermometers, and requesting to be informed whether the instruments can be exchanged.

From Messrs Smith, Elder and Co., dated London, 29th January 1850, advising of a shipment on the *Herefordshire*, and enclosing an invoice of the same, and also a statement of their account up to 31st December 1849, showing a balance in their favor of £21 5s. 1d.

PAPERS.—Meteorological Observations for the month of April from Aden, forwarded by Mr Mayes, through the Political Superintendent at that station.

Monthly Means of Maximum and Minimum Pressure from 1845 to 1849, taken from the Meteorological Register kept at the Surveyor General's Office, Calcutta. Latitude 22° 33′ 28·33″ North, Longitude 88° 26′ 42·84″ east.

Calcutta Meteorological Observations for the month of April 1850.

Trevandrum ditto ditto ditto ditto.

Sattara ditto ditto for the month of May 1850, from Government.

BOOKS.—March Number of the Journal of the Indian Archipelago and Eastern Asia. Presented by Government.

Greenwich Magnetical and Meteorological Observations for 1847. Forwarded by the Royal Society of London.

Briggs's Cities of Gujarashtra. (Purchased.)

THE ordinary monthly meeting of the Bombay Geographical Society took place on Thursday 15th July,—the Hon'ble J. P. WILLOUGHBY, Esq., President, in the Chair. Present—Colonel G. MOORE; Captain J. C. HAWKINS, and Commander G. B. KEMPTHORNE, I. N.; Dr B. A. BREMNER; N. OLIVER, Esq., I. N.; Professor J. PATTON; Dr B. WHITE, Medical Storekeeper; JOHN RITCHIE, Esq., Supt. P. & O. S. N. Co.; Dr M. JOSEPH; and Dr G. BUIST, Secretary.

The Minutes of last meeting having been read and approved of, the Secretary stated that an oversight had occurred in their not having appointed Committees on papers and on correspondence and accounts at last meeting. The usual mode of doing this was by ballot—that is, by each member noting the names of the members desired to be elected on slips of paper—the majority of votes being determined by scrutiny. The following was the result of the ballot:—

Committee on Papers:—Major J. Holland, *Chairman*. Captain H. Barr, Commander G. Jenkins, I. N., S. S. Dickinson, Esquire, John Smith, Esquire, and Captain J. C. Hawkins, I. N.

Committee on Accounts.—Captain H. J. Barr, *Chairman*, Captain J. C. Hawkins, I. N., Major J. Holland, Commander G. Jenkins, I. N., S. S. Dickinson, Esquire, and John Smith, Esquire.

The first motion on the notice list referred to the printing of the revised regulations brought forward last meeting by Mr N. Oliver by desire of Commander Jenkins, in absence of that officer. The Secretary stated that to expedite matters he prepared a circular, to be sent round after last meeting, with what he understood to be Commander Jenkins' views on the subject. To make sure on this point he had first sent the circular, and accompaniments, to Commander Jenkins himself. The revised regulations were simply the original regulations as altered subsequently, with various additions from time to time made on these and enforced from the time of their establishment—all duly recorded in the minutes. These were all intended to have been printed correctly in the Almanacs of last year: had they been so, the present motion would have been superfluous—from some blundering about the office the errors referred to occurred. He (the Secretary) had prepared a set of bye-laws, which seemed eminently desirable for the smooth and easy working of the Society, and was under the impression that Commander Jenkins had volunteered to bring these before them. There had been some misconception on the matter. Commander Jenkins had returned the revised regulations, with various others long since obsolete or repealed, such as the revival of the name Bombay Branch of the Royal Geographical Society, and the reunion of this with that Society long since broken; and he had stated that he considered the bye-laws superfluous. Under these circumstances the circular was not sent round, and the open motion now before them was placed on the list. He (the Secretary) considered the byelaws perfectly indispensable for the management of business.—On the motion of Mr. Willoughby, seconded by Mr Oliver, the whole matter was referred to the Committee on Papers.

The Secretary stated, in bringing forward the following extracts from the Report laid on the table at the annual meeting, he merely desired to draw attention to the subject; and after moving that Government should be written to regarding them, he should withdraw the motion if the Society deemed it expedient. The first paragraph referred to was the following: he had no doubt, however, that their able Vice-President, Commodore Lushington, would attend to the matter so soon as it was brought under his notice. He would merely read the paragraph, which was as follows:—

"The Marine Barometers were on a principle almost entirely new for this variety of instrument, and they were of the utmost beauty, suited either to serve for Marine, for Mountain, or Observatory purposes, and the object in having them thus constructed was this. Though observations made at sea by ships under weigh, and constantly changing their latitude, and the season of their observations, are of comparatively little value: at anchor at any given spot a vessel may with very little trouble be converted into an observatory. The vessels of the Indian Navy, or of the P. & O. S. N. Company—a copartnery which in its devotion to science shames the efforts of many Governments,—frequently lie at anchor for days or weeks at and off Bushire, Bussora, and Bassadore, in the Persian Gulf,—off Jodda and Suez in the Red Sea, off Singapore, and off Hongkong in China. Were each of these periods of repose taken advantage of, and fitting instruments at hand, the Barostices might be obtained, and probably one day's hourly readings for every month in the year, and thus an important step be taken in the elucidation of one of the most important points in meteorology—the determination of the pressure due to each hour of the day and season of the year at every different degree of latitude, so far as our researches could be made to extend. The instruments sent us are eminently well suited for the objects in view, which will I have no doubt, through their means, and such agencies as those alluded to, be speedily attained. Another object of the utmost importance in Physical Research was proposed to be effected by means such as those in measuring altitudes. For pressure observations on the shores say of the Red Sea or Persian Gulf,—it is next to impossible for a traveller at present to secure a reference barometer."

Having read this, he begged to withdraw the motion on the subject.

The next paragraph was the following in reference to the services and merits of Corporal Leach. Mr Leach had undertaken the task of observation of his own accord, without any stipulation; but as Captain Powell had stated that a Purvoo at Rs. 40 a month would be requisite to read and record observations if entrusted to his care, he, the Secretary, promised to bring the matter of compensation before the Society, in hopes that it would recommend him to Government. The rest of the extract required merely to be read. Mr Leach had recently offered his services to the Society, and there was no doubt that were it known how valuable these might become, or the high appreciation that is placed on them, the Bengal meteorologists would at once see that he no longer remained idle:—

"H.M.'s 22nd foot is now at Dugshai in the Jullundhur Doab: a letter received from Mr Leach on the arrival of the corps at the station, intimated his willingness to resume his labours in the service of the Society provided he could be supplied with instruments. The Jullundhur belongs to the Bengal rather than the Bombay scheme of research,—the results of the former having however been assured me by the Governor-General. It may be as well here to quote the remarks made on a former occasion before the Society in reference to Mr Leach's exertions at Kurrachee: on his leaving, I undertook to move the Society to apply to Government for an allowance to him similar in amount to that recommended to be given to a purvoo proposed to be allowed the observatory at Minora Point—Rs. 40 per mensem,—and now beg to recommend that Government be addressed on the subject; Mr Leach was four months in our employment:—

"'Attention was specially directed to the exertions of Mr Leach at Kurrachee. Mr Leach had been provided with instruments late in *April*: at first there was no objection to his using them, when the commanding officer had stated on the matter being fully explained, that he saw no reason why a soldier should not amuse himself with barometers or thermometers as well as with long-bowls or racket, if it did not interfere with the discharge of his duty. Mr Leach (who had been an assistant to Mr Mayes in his meteorological labours at Aden) had instructed some of his comrades, so that the work might go on without interruption. He had commenced on the 1st of May, and he had on the 5th of June forwarded the following papers:—observations for every

hour, taken for twenty-four hours on end, for the 1st, 8th, 15th, and 22nd; for every day of the month hourly from sunrise to sunset, and the barometer's turning-points (barostices) at ½ past 3 and ½ past 9 A. M., and 4 and 10 P. M. These barometrical readings had been entered as taken, then corrected for temperature &c., and filled in in schedules provided by the Society, so as to be at once fit for the printer's hands; while neatly drawn up diagrams accompanied them, which furnished a key in a moment to the tables. Mr Mayes and Mr Leach furnished most eminent examples of zeal and industry,—yet it would in all likelihood be found that there was not an European corps in India in which there were not abundance of officers who with the good sense and good feeling of Major Smith, were at all times most anxious to find amusement or occupation for the men—the more intellectual and improving so much the better,—and abundance of soldiers most ready to undertake any researches of this sort that might be entrusted to them. It was in the conviction of this, that the scheme of the Society was originally started: they had never had the slightest hope of success save from amateur exertion, and in this they had unbounded faith.' "

The paragraph having been read, it was not considered necessary that the Society should as a body do anything in the matter: the publication of the extract would probably serve the ends in view. It was agreed that Government should be addressed on the subject of compensation.

The next extract referred to certain instruments of a much more cumbrous and expensive nature than those contemplated by the Society: still, as they were in the possession of Government, it would be a great pity to allow them to remain idle or useless.—

" In December, 1848, Government intimated its willingness to place certain instruments in their possession at our disposal: it was not till the 6th April 1849 that the instruments in question could be made available, and until that was the case, the Society could take no steps to provide themselves elsewhere, as they were ignorant of what Government possessed. The instruments proved to be a Tide-Gauge, purchased from me in February 1846 for service at Kurrachee, a pair of Thermometers, with a large Self-Registering Tide-Gauge by Bunt, and Wind and Rain-Gauge by Newman, on the pattern of Ostler. The Tide-Gauge was at the time reported on as being too cumbersome for transmission to an outstation, as the structure required by it would cost more than a lesser gauge house and all. The instrument is a very beautiful one—the clock portion of it a fine dead beat, which would well serve the ends of a time-piece anywhere. It might easily be exchanged for the small-sized light Tide-Gauge now in use at Colaba,—the latter being employed for out-station duty,—or it would be valuable for tidal observation, as well as for clock purposes, at the end of the Apollo Pier, or on any conspicuous place at the Dockyard bunder. It is a pity such an instrument should remain useless. The monsoon had arrived before the instruments could be fitted up with houses, and got ready for dispatch, and since September I have been in a great measure off duty. The Wind and Rain-Gauge was sent to Major Jacob at Sawunt Warree, but found too cumbrous for any building at his disposal: it was then offered to Mr Dalzell at Vingorla, who found its size inconvenient, and it is now on its way to the presidency to await the determination of Government or of the Society.

" The Society never contemplated the use of instruments so ponderous, expensive, and burthensome to set up, as those of Ostler, of which two will be returned from Aden so soon as Mr Mayes is recalled, in addition to that now referred to; and it would be a pity, now that we possess them, that they should not be employed. I beg respectfully to recommend to the Society that they suggest to Government that that now on hand be sent to Ahmednuggur, to be placed under charge of Captain Gaisford of the artillery, well known as a man of science, and already recommended to us through Government as an observer. It will here afford a record of the rains and winds 200 miles beyond

the ghauts, and which ought to be of interest, while the other apparatus of an observatory committed to the charge of the artillery officer at the station, might secure us, where European sentries are at all times on duty, an invaluable series of hourly observations. We have never yet learnt how the two Aden wind-gauges were come by: one of these might probably be stationed at Poona, the other at the Mahabuleshwar Hills or on the top of Singhur, where I have no doubt the officer of the 10th Hussars whose bungalow might seem best suited for its reception, would see to its erection. It is an object of much interest to know at what rate the fall of rain decreases or encreases as we advance into the interior or ascend to considerable elevations,—as also to determine at what hour the wind changes, and in what direction it passes in its change, under these circumstances as compared to the coast: and perhaps the summit of Neat's Tongue close beside us, an elevated mountain one thousand feet high, might be considered a not undesirable site. A house of frame-work would suffice for the instrument, and an intelligent native could probably be got to watch over it for Rs. 8 or Rs. 10 a month. Whatever may be thought of these recommendations, it will, I imagine, be agreed that on no account should expensive instruments such as those on hand be allowed to lie idle when they can be employed."

The Secretary was desired to address Government on the subject.

The next extract referred to the reduction of the Wind and Tide Curves of the Aden Observatory, and was as follows:—

"I have not as yet been able to have the tracings of the self-registering tide or wind-gauges written off or reduced, and so large a mass of these has accumulated that I should recommend them to be placed in the hands of some one possessed of sufficient leisure and competent to undertake their reduction. Should Mr Mayes be recalled from Aden he might very advantageously be employed in this, or the services of some of my former assistants at the observatory—one of whom I have had frequent occasion to employ in such matters—might be secured for the work, which he would, I have no doubt, perform satisfactorily. No time should be lost in this—the Aden report cannot be completed until a register of the wind at all events shall have been prepared."

The Secretary was directed to secure the services of a competent person to perform the work: the charge to be placed to account of publication.

The following papers, letters, and books, were laid on the table: the paper of Captain Jones was directed to appear in the first issue of the Society's Transactions, now nearly ready for publication.

LETTERS.—From Messrs. Smith, Elder & Co., dated London, 31st January 1850, advising the shipment of a package per "Herefordshire," and enclosing a duplicate Bill of Lading for the same.

From J. G. Lumsden, Esq., Secretary to Government in the Marine Department, No. 557 of 1850, dated 13th June last, stating that the officer, conducting the duties at Kurrachee, has made a requisition on the executive engineer for a Square Frame of Teakwood 18 feet high for the Machinery of a Tide gauge to be erected at Manora point, the probable cost of which will be about Rs. 300. In making this requisition the officer has stated that he does so in accordance with the wishes of the Bombay Geogl. Society: and requesting that the Government may be favoured with an explanation of the views and intentions of the Society in relation to the proposed structure and the expense attending it.

From Captain H. L. Evans, Political Assistant in Nimar, No. 191 of 1850, dated 13th June last, acknowledging the receipt of the Society's letter, No. 44, dated 29th ultimo, and informing that the Barometer and Thermometers dispatched for him have been duly received, the glass of the former broken, and it seems to be damaged as it does not vary.

From Dr. J. Murray, 26th Regiment N. I., acknowledging the receipt of the Society's letter of the 31st ultimo, and requesting that a pair of self-registering Thermometers and a Pocket Compass be forwarded to his address by Bangy Dak, dated 16th June 1850.

From D. F. Macleod, Esquire, Commissioner in the Punjaub, dated Dhurmshalla via Kangra, 17th June 1850, requesting to be proposed as a member of the Society, if members of the Services of other Presidencies be admissible, and stating that Mr. Lumsden will second the proposition.

From J. G. Lumsden, Esquire, Secretary to Government, No. 2573 of 1850, dated 28th June last, requesting that the thanks of Govt. be conveyed to the Society for the twenty copies of the Treatise on Rain-gauges forwarded with the Society's letter of the 22nd May 1850.

From Dr. John Scott, Secretary to the Medical Board, No. 976 of 1850, dated 26th June last, returning, by direction of the Medical Board, an Indent for Instruments to be returned into the Medical Stores, with the sanction of the Board recorded thereon.

From J. G. Lumsden, Esquire, Secretary to Government in the General Department, No. 2454 of 1850, dated 20th June last, informing that the Society's letter, dated 20th May, No. 36, was referred to the Medical Board, who have reported that there are no Bath Thermometers by Newman in the Medical Stores.

From Messrs. Adie and Son, dated Edinburgh, 29th April 1850, acknowledging the receipt of the Society's letter of the 15th March last, with its accompaniment, a bill on London at 3 months' sight for £90, which will be to the credit of the Geogl. Society's account; also informing that the barometers of the Society's second order are all ready, and the Thermometers will be so in a few days, for transmission to Bombay.

From J. G. Lumsden, Esquire, Secretary to Government in the General Department, No. 2640 of 1850, dated 3rd instant, transmitting for the information of the Society the annexed extract paras 2 and 4 of a letter from Her Majesty's Consul, and the Hon'ble Company's Agent at Muscat, dated 15th April 1850.

From Wm. Simpson, Esquire, Civil Auditor, dated 5th July instant, requesting to be furnished with the Annual lists of European and Native uncovenanted servants with as little delay as possible.

From E. Roberts, Esquire, dated Surat, 1st July, stating that on examination of the instruments he is much delighted with the result, and has now determined to keep them, forwarding a Hoondee for Rupees 85, the amount of his Bill.

From R. C. Knight, Esquire, in Medical Charge Political Agency, dated Kotah, 29th June 1850, informing that the Most Noble the Governor-General has sanctioned the purchase of certain Philosophical instruments to enable him to fulfil the instructions of the Medical Board in making a Series of Meteorological observations, and requesting to be supplied with a number of instruments enumerated in the list which accompanied his letter under reply.

From F. Ross, Esquire, dated 7th May 1850, enclosing a Register of the Temperature at Kurrachee from 1st January to the 31st March of this year, which may be found of some interest to the Society.

From A. Malet, Esquire, Chief Secretary to Government, No. 3317 of 1850, dated 12th July 1850, transmitting for presentation to the Society in the name of Government and for publication amongst the proceedings of the Society, a Narrative of a journey undertaken by Commander Felix Jones, of the Indian Navy, for determining the tract of the Ancient *Nahrwan* Canal, accompanied by a map, plans, and sketches, in illustration thereof.

From Commander C. W. Montriou, I. N., Superintendent Observatory, No. 42 of 1850, dated 17th July instant, forwarding a Copy of the Electrometer observations made during the 13th and 14th June last, at the Observatory, Colaba.

From J. G. Lumsden, Esquire, Secretary to Government General Department, No. 2799 of 1850, dated 17th July, forwarding for the use of the Society a copy of a work entitled "Statistical report of the district of Cawnpoor. By James Mountgomery, Esquire, Civil Service."

PAPERS.—Meteorological abstract for the month of May 1850, taken at Aden.

Meteorological abstract for the Months of April, May and June 1850, taken at Kolapoor.

Meteorological abtract for the months of April, May and June 1850, taken at Dhurwar.

Meteorological abstract for the months of May and June 1850, taken at Sattara.

Meteorological abstracts for the months of January, February and March, taken at Ahmedabad, and April, May and June 1850.

Meteorological abstract of Pahlunpoor for April, May, and June.

Meteorological abstract for the months of April and May 1850, taken at Calcutta.

Meteorological abstract for Bhooj, for April, May, and June.

Meteorological abstract for the months of May and June 1850, taken at Madras.

Meteorological abstract for the months of April and May 1850, taken at Trovandrum.

Atmospheric Pressure at the Turning Points of the Barometer corrected for temperature about 4 and 10 A. M. and P. M. clock time, from Woosung and Shanghai.

Meteorological Register for the months of January to Dec. 1849, taken at Kurrachee.

Presented by Government.—Preliminary Remarks on the Nahrwan Canal, with a glance at the past history of its province, with a map, plans, and sketches, in illustration thereof. With a letter from A. Malet, Esquire, Chief Secretary to Government, No. 3317 of 1850, dated 12th July 1850.

From Commander Moutriou.—Bombay Electromotor observations,—1850.

Books.—Complete set of the Royal Geographical Society's Journal of London, in 10 Volumes. Presented to the Society.

Bought of Messrs Smith, Elder and Co.—10 Copies of the Admiralty Manual of Scientific Inquiry, by Sir Herschel, Bt., received per "Herefordshire."

From Government.—Statistical Report of Cawnpoor, 1848.

The Secretary stated that a large collection of returns from the various Civil Surgeons entrusted by Government with the task of observing, had been received: generally speaking, the gentlemen in question seemed to have entered with much energy and zeal into the performance of the task assigned to them, and with the most anxious wish to meet the views of Government. There was a total want of barometric, and a deficiency of hygrometric, observations: the thermometric observations were copious and apparently correct. Errors in entering them might occasionally be detected, and on these points some had been written to, others made aware of the errors by newspaper notices: in all cases these would be corrected before going to press. Less weight than was due to them seemed to have been attached to general remarks,—often of much greater interest and value than instrumental observations. There seemed no reason to doubt that in a very short period of time the wishes of Government would be most fully met. In reference to the letter from Government concerning observations at Zanzibar, it was stated that the Society had done everything in their power, but without effect, to be placed in communication with Mr George, who seemed a highly intelligent and eminently industrious man; that not only was his own assistance desired, but it was wished that he should have taken with him instruments for the Island of Johanna. The difficulty of the task desired to be imposed seemed to have been sadly overrated: as it was, nothing more could have been done. Government had done everything in their power on the occasion.

Dr Buist said that he had now to place his resignation of the office of Secretary in their hands. During the eight years he had held it he had done all in his power to perform its duties aright, and he had much reason to remember with gratitude the kindness and indulgence that had been shown him. It was now no longer possible for him to bestow on them the time and attention that were requisite, and though he hoped to be able to share largely in such of their labours as did not require office attendance or punctuality in point of time—which might in some wise be performed when and where he liked,—he could not hereafter undertake to be present at all their meetings, or to afford those periodical and immediate replies to correspondents which were indispensable. In this matter, indeed, he had much reason to apologise to gentlemen out of doors, and to express his regrets that letters had on many occasions been left unreplied to, and that others had been answered tardily which ought to have been so at once. These matters arose from misfortune rather than culpability—still they were matters of much regret. He could only hope that with all his short-comings and delinquencies, the interests of the Society on the whole had not taken injury while entrusted to his hands.

Mr WILLOUGHBY said that they had no right to press Dr Buist to remain in their service after he felt the discharge of the duties of Secretary incompatible with that of others which had a more direct and more immediate claim on him. When the Circular announcing Dr Buist's intention was first sent round, he had hoped that the Committee should have been able to induce him to remain. He could not perhaps do better than read the Circular, with the minutes appended to it, to shew the views of the Committee :—

To the Hon'ble J. P. WILLOUGHBY, Esq., Commodore LUSHINGTON, Colonel MELVILL, Captain HAWKINS, and other members of the Geographical Society.

GENTLEMEN,—The prospect of a large addition to the ordinary amount of my duties compels me to tender my resignation of the Secretaryship of the Geographical Society, only continuing to act, should such be your pleasure, until the appointment of my successor.

2. While compelled to take this step, from the prospects now before me rendering it improbable that, after the 1st September, I shall be able to assure myself of sufficient leisure to attend your meetings with that punctuality required of a Secretary, I trust to be able to assist at them in that division of your researches which has been especially entrusted to my charge. I shall be happy to continue to watch as heretofore over the Observatories in charge of the Society, to superintend the preparation and publication of its papers, or endeavour to perform any other work in which I may not be restricted as to time. The minuting of your proceedings, and conducting the ordinary business and correspondence of the Society, are easily performed by any one who has a larger amount of leisure than I have at command.

3. I enclose for your perusal letters from the Hon'ble Mr D. Bethune, Mr Jacob, Captain Thuillier, with an extract from a letter from Colonel Sykes, as indicating the manner in which our labours are elsewhere seconded or appreciated, and I have also the honour to submit correspondence with the Madras and Bengal Governments on schemes kindred to our own researches. The researches here referred to, though meant to furnish matter for papers for the Society, and which I hope may be honoured with a place in the meteorological department of their journal, are my own exclusively, and will impose no task whatever on the shoulders of my successor.

4. My object has been to afford to every one desiring it the freest access to my own papers, or the records entrusted to my care, so as to enable every one so disposed to share in, or to benefit by, our labours at any stage in their advancement. I have kept your records on these subjects as full and orderly as possible, so that nothing has been attempted or accepted of which fell within the scope of our task without being found in our archives; and in this has lain the heaviest portion of my labours for the past five years. Government have done me the honour of giving a place in their archives to the correspondence on these subjects with Bengal and Madras, that there may at no time be any risk of break or misunderstanding on the pursuits now happily so extensively followed throughout India.

5. The report, of which some extracts were read at last General Meeting, and which is now in the Printer's hands, will afford the fullest explanation on every part of our proceedings; and should any obscurity or difficulty be found, I shall be at all times most happy to assist the Secretary or Committees of your Society in any way in my power.

6. The meeting of the Asiatic Society having been made a week earlier than usual, has taken me by surprise, and compelled me to place this in your hands more close on the day of meeting than I could have desired.

I have the honour to be, Gentlemen, your most obdt. servant,
GEO. BUIST, Secretary to the Bombay Geographical Society.

Bombay, 12th June, 1850.

MINUTES.

I very much regret that the Bombay Geographical Society is about to lose the valuable services of Dr Buist, and I could much wish, that, with a due regard to other avocations, which have a greater claim on his time and attention, he could be persuaded to continue to act as Secretary for some time longer.

I am satisfied that my colleagues, as well as the members of the Society generally, highly appreciate the services which Dr Buist has so long and ably rendered. It is to his zeal and indefatigable industry that the Society is in a great degree indebted for the reputation it has acquired, especially in the meteorological department, to which our attention has of late been so much devoted.—J. P. WILLOUGHBY. 12th June.—J. Holland, C. Morehead, George Moore, H. Conybeare, A. Maket, A. Spens.

I fully concur in the remarks made by Mr Willoughby, and beg to add my sincere wish that Dr Buist will continue to act a short time longer.—S. Lushington.

I quite concur in the remarks made by the President, and trust Dr Buist will remain to act as our Secretary.—J. C. Hawkins, 12th June.—J. Ritchie, W. Howard, J. Smith, H. Barr, B.A. Bremner.

The welfare of the Society is much dependent upon the continuance of the present Secretary—all must concur in this.—T. L. Jenkins.—I concur in the above. J. Vaupell, G. B. Kemp-thorne.

A second Circular had been sent round by Dr Buist, which he also read, showing that their hopes of retaining his services could not be realised, and this he had recommended to be reported to the present meeting.

To the Hon'ble the President and Members of the Geographical Society.

Gentlemen,—I deeply regret that an accident prevented me being present at the last Meeting, to have placed my resignation as Secretary in your hands. I feel greatly touched by the kind manner in which you speak of my services, and the high value you are pleased to place on them. Humble as is my estimate of their value, compared to that which you put on them, they should have been at your command so long as you desired to possess them, had circumstances so permitted. As it will from henceforth be altogether impossible for me to assure myself of leisure to be present at all your meetings, or to give that attention to accounts, correspondence and details, which is indispensable for the welfare of the Society, I beg once again to place the appointment in your hands. If it be really considered of any consequence that my name should occupy the place on your records it for eight years has held, I shall be happy to act as conjoint Secretary with any gentleman you may please to nominate. If I may venture to suggest, I think few of your Members would be found better qualified for the post than Professor Patton. I shall be happy, as formerly stated, to conduct if required, conjointly with the committee, your researches in Physical Geography; and to pass through the press the papers recommended for publication, or to perform any other duty which does not require attendance in your rooms, or absolute punctuality as to time. I forward along with this, papers formerly circulated, as these have been seen by a part of the Members of the Society only.

I hope to have the honor of being present at the meeting on the 18th instant, but this is the last time I can assure myself of the gratification of acting as Secretary at your Meetings.

I have the honor to be, Gentlemen, your most obedient servant,

Geographical Society's Rooms, 8th July, 1850. George Buist, Secretary to the Society.

Mr Willoughby then moved the following motion, which was seconded by Colonel Moore :—

"That Professor Patton be requested to undertake the office of joint Honorary Secretary to the Bombay Geographical Society."

This having been carried unanimously, the following motion by Mr Willoughby, seconded by Captain Hawkins, was agreed to unanimously :—

"That in accepting Dr Buist's resignation of the office of sole Honorary Secretary to the Bombay Geographical Society, this meeting is desirous of recording the high sense it entertains of the able and efficient manner in which he has officiated in the above capacity during the last eight years, and of the zealous manner in which he has on all occasions endeavoured to promote the objects for which the Society was established."

Dr Buist having expressed the deep sense of gratitude experienced by him for the kindness with which he had been spoken of,—he and Mr Patton intimated their acceptance of the office of Joint Secretaries.

H. Young, Esq., C. S., was elected a member of the Society. Lieut. H. G. Raverty, 3rd Bo., N. I., was proposed as a Member of the Society by the Hon'ble the President, seconded by Colonel Moore, to be balloted for at the next monthly meeting.

THE ordinary monthly meeting of the Bombay Geographical Society was held on Thursday, the 15th August, 1850, in their rooms, Town Hall. Present—C. J. Erskine, Esq., in the chair. Captain J. Estridge; Commander G. Jenkins, I. N.; John Smith, Esq.; Venaikrow Juggonathjee, Esq.; Dhunjeebhoy Framjee Esq.; and Professor Patton, Secretary.

In the absence of the Hon'ble the President and Vice-President, Mr Erskine was requested to take the chair.

The minutes of the last meeting having been read and approved of, the Secretary stated that the report of the Committee on printing the Revised Rules was not quite ready to be laid before the Society. He said that the circular to the committee had been only returned in the morning, and contained some suggestions, which should be adopted, and he had not had time to prepare, nor to submit to the committee, a complete list of the rules as they now stand, without any of the repealed clauses. He hoped, however, that the committee would be prepared to lay before the Society their final report at next meeting.

The following letters, books, and papers, received during the month, were then submitted to the meeting:—

LETTERS.—From Mr Mayes, dated Aden, 12th July last, forwarding his observations for the month of June, with tidal observations, from 12th May to the 9th July 1850, with a list of Meteors, as observed during the months of March, April, and May; likewise the Anemometer papers, with Thermometer observations, as taken on Shum-Shum, during the month of June last.

From Col. Twemlow, dated Aurungabad, 24th July last, stating he has succeeded in procuring the Upper Jaws and Tusks of a gigantic fossil animal, which must have been submerged at a remote period, when the Godavery was perhaps a succession of Lakes, and requesting the Secretary to refer to Cuvier's work, and to find out what animal it may have been.

From Brigadier George Twemlow, dated 3d August 1850, intimating that he had received some plates of fossil ostrology from Dr Bradley, which had tended to clear up the difficulty he had experienced in understanding how the tusks were attached, and stating that he agrees with that gentleman that the fossil may be that of the Elephas Primigenius; and if so, what has become of the forests in which he fed? will become a question of interest.

From Norton Shaw, Esquire, Secretary to the Royal Geographical Society of London, dated 18th January last, acknowledging the receipt of a present of Transactions of the Bombay Geographical Society from October 1848 to May 1849.

From Captain W. O'Brien, commanding Hill Rangers, Boldanah, requesting to be furnished with a priced list of such instruments as may be expected from England, and also a *good* set of mathematical instruments, either in a case or box.

From Colonel P. M. Melvill, dated Poona, 9th instant, enclosing a cheque for the amount of his annual subscription to the Society for 1850.

From Captain E. Whichelo, Deputy Commissary General, No. 4762 of 1850, dated the 12th instant, asking the price of the Barometers in the possession of the Society, and requesting one to be sent to him for inspection.

From Commander A. Macdonald, I. N., dated 13th instant, requesting that his name may be withdrawn from the list of members of the Society.

From E. Roberts, Esquire, dated Surat, 12th instant, requesting to convey his thanks to the Society for the copy of the Admiralty Manual, which has been supplied to him, and forwarding a Hoondee for the amount of Rupees (7) seven.

PAPERS.—Meteorological abstract for the months of April, May, and June, taken at Surat.

Dtito...	...	...ditto...	...	...ditto...	...	...Broach.
Ditto...	...	...ditto..	...	...ditto..	...	...Alibaug.
Ditto...	...	...ditto..	...	..ditto...	...	...Rajcote.
Ditto..	...	..ditto for June, from Calcutta.				
Ditto..	..	..ditto...	...	...ditto...	...	...Aden.
Ditto...	...	...ditto...	...	...ditto...	...	...Trevandrum.
Ditto...	...	...ditto for April, May, and June,			...	...Hydrabad.
Ditto...	...	..ditto for March, April, and May,.....				Larkhana.
Ditto...	..	...ditto from February to June, ...				...Shikarpoor.
Ditto..	...	...ditto for July... ...	...	...	...	...Sattara.

BOOKS.—Presented by the Royal Geographical Society of London. The Journal of that Society, Vol. 19th, Part II., for 1849.
Presented by the Society. "Bulletin" of the Geographical Society at Paris, Tome XI., for 1849.
By the Society. Journal of the Asiatic Society at Paris, Tome XIV., for 1849.

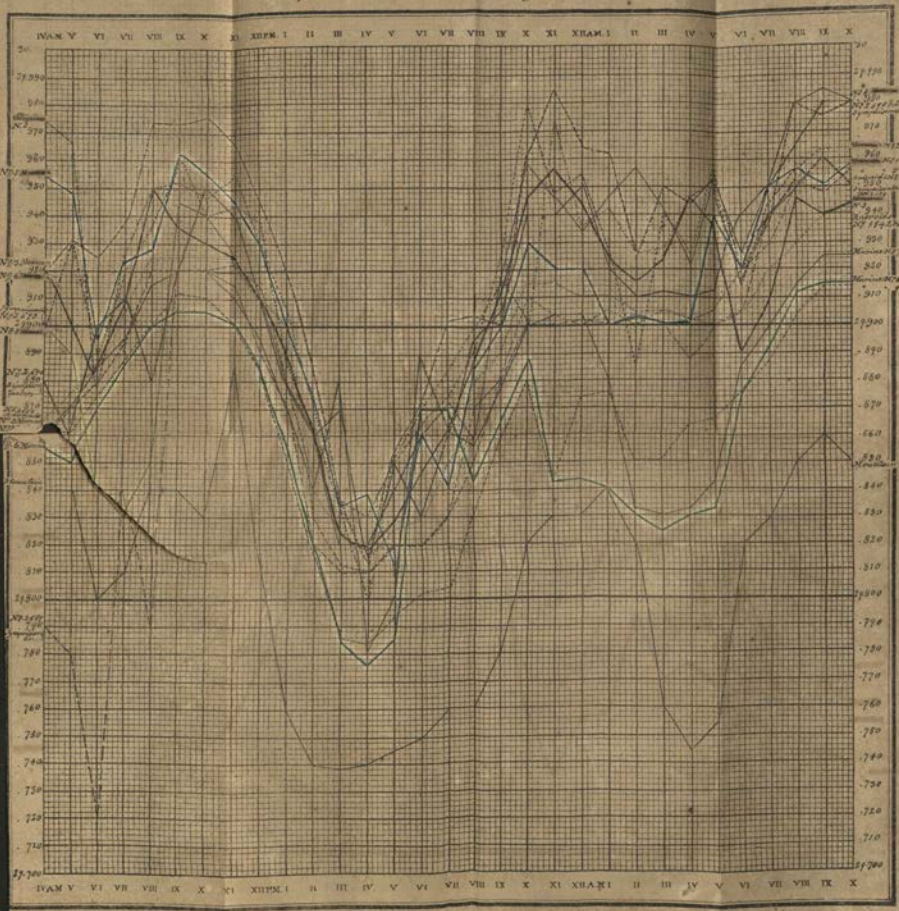
In reference to Brigadier Twemlow's letter, the Secretary stated that he had not been able to compare Dr Bradley's drawings with Cuvier's plates, but that he had compared them with a head of a fossil "Elephas Primigenius" in the rooms of the Asiatic Society, and he found them to correspond exactly, with the exception that the head, found at Moonghy Poitun, is much larger, the dimensions being—extreme height of molar 5 inches, length 14 inches, breadth 4 inches, breadth of jaw 12 inches, and circumference of root of tusk 27 inches. He also stated that the Secretary of the Geographical Society of London, after thanking the Society for the present of their Transactions, requested to be supplied with some missing numbers of the Transactions of the Bombay Geographical Society, which, he said, were much read; and also communicated the pleasing intelligence that a Mr F. Galton, one of their members, and Mr Anderson, a Swede, were to start with a boat for the Great African Lake, with the intention of penetrating as far as possible into the centre of the country.—The meeting directed the Secretary to supply the missing numbers.

Henry Young, Esq., proposed by the Hon'ble Mr Willoughby, and seconded by the Secretary, Dr George Buist,—and F. D. McLeod, Esq., prosposed by Dr Buist, and seconded by J. G. Lumsden, Esq.,—were balloted for and duly elected members of the Society.

Commander Stephens, I. N., was proposed by Commander Griffith Jenkins I. N., and seconded by John Smith, Esq., to be balloted for at next meeting.

The Society then adjourned.

Curves of Barometers, Marine and Mountain, Sympiesometers, and Aneroids, read together at Bombay 56 feet above the Sea, from 4 A.M. 14th to 10 A.M. 15th May 1850.



TRANSACTIONS

OF THE

BOMBAY GEOGRAPHICAL SOCIETY.

ART. I.—*A Report on "Torun Mal" in the Satpoora Mountains, in the Sultanpoor Talooka of the Collectorate of Khandesh, dated Camp at Shada, the 28th April,* 1849. By Lieutenant C. P. RIGBY, Western Bheel Agent.

No. 2574 of 1849.

From A. MALET, Esquire, *Chief Secretary to the Government of Bombay,*
To GEORGE BUIST, Esquire, LL.D., *Secretary to the Geographical Society.*
Dated 14th June, 1849.—*Political Department.*

SIR,—I am directed by the Right Hon'ble the Governor in Council to transmit to you, for presentation in the name of Government to the Bombay Geographical Society, the accompanying copy of a letter and of its enclosures from Lieutenant RIGBY, Bheel Agent in the Western Districts of Kandesh, submitting a report on "Torun Mal," in the Satpoora Mountains, in the Sultanpoor Talooka of that Collectorate.

I have the honor to be, Sir,
Your most obedient servant,

BOMBAY CASTLE, 14*th June,* 1849. A. MALET, *Chief Secretary.*

No. 27 of 1849.

To ALEXANDER ELPHINSTON, Esquire,
Collector and Magistrate, Khandesh.

SIR,—With reference to your endorsement, No. 334 of 1849, dated the 23rd ultimo, forwarding me Copy of a Correspondence relating to a settlement of the feud between the Bheels of the Burwani State, and Koshia Naik, of Sindee, in the Akranee Purgunna, and desiring me, with reference to Lieutenant Evans's remarks on

"Torun Mal," contained in the above Correspondence, to avail myself of any opportunity that may present itself of acquiring information regarding the climate and salubrity of that place, I have the honor to state that I have since visited "Torun Mal," and that the result of my observations is as follows :—

2. "Torun Mal" is situated in the heart of the Sathpoora Mountains, and forms the most elevated plateau of the whole range. It is in the Akranee Purgunna, about forty miles north east from Shada, the chief town in the Sultanpoor Talooka, and the nearest place from which supplies are procurable : its distance from Mhow viâ Chikulda is about 140 miles ; from Mundlaisir, also viâ Chikulda, about 80 miles. As far as Chikulda the road is very good : from Chikulda to Torun Mal, a distance of about 60 miles, it is a mere foot-path through dense jungle, and a very mountainous country ; from Baroda its distance viâ Sagbarra and Shada is about 150 miles ; from Surat viâ Nowapoor, Nundoorbar, and Shada, about 160 Miles ; from Dhoolia, 90 miles ; and from Malligaum viâ Dhoolia, 120 miles. All these roads are very good, and practicable for wheeled carriages to within about 20 miles from the summit of Torun Mal.

3. The table-land of Torun Mal forms an irregular plateau, about twenty miles in circumference : its surface is however much broken by deep wooded ravines and by irregular-shaped hills, rising from 300 to 600 feet above the general level. Towards the north-east end of this table-land are two lakes, the upper one of which is between two and three miles in circumference,—its water is perfectly clear, the bottom being composed of sand and loose stones. I ascertained the depth of the water in its centre to be thirty-six feet, on the east side, a few yards from the bank, thirty-one feet, and on the west side twenty-seven feet deep. It contains no alligators nor fish, and the inhabitants say that fish put into it invariably die : it contains a great quantity of a small species of shrimp, of which the Bheels take considerable quantities for sale to the neighbouring towns in the west of Khandesh: its surface is covered with different species of wild fowl.

4. This upper lake is partly artificial, the east side being formed by a Vellard extending across the valley at its gorge. The natives considering this Vellard beyond the power of human beings, ascribe its construction to Goorucknath, the presiding deity of the place,

and, from its immense solidity and extent, it would certainly be considered an extraordinary work in any age and country. I ascertained, by measurement, its length to be four hundred and forty yards, breadth at base ninety-eight feet, ditto at surface twenty-eight feet; height eighteen feet. A passage has been left at the south end of this Vellard for the discharge of the superfluous water of the lake, and a channel cut to conduct it to the lower one, which is much smaller than the upper, and is said to sometimes dry up in the hot season. From this lower lake a broad channel has been cut for a considerable distance, which conducts the water over a perpendicular fall between 500 and 600 feet high into the valley below.

5. The sides of the Vellard of the upper lake are thickly shaded by wide spreading trees of the Ficus Indica, Ficus Religiosa, Calyptranthes Jambolana &c., which also shade a great part of its upper surface,—which being, as before stated, twenty-eight feet broad, affords ample space for tents, or small bungalows, and as a westerly wind prevails almost without change during the hot months, tents on this Vellard, receiving the breeze directly across the lake, are kept very cool the whole day.

6. The surface of the lake is about four hundred feet below the groups of hills which border it on the south and south-west sides; the hills and plains being thickly studded with groups of large spreading carunda bushes, the toorun, a tall shrub, bearing a sweet berry peculiar to these hills, the wild mango, the ficus religiosa, the calyptranthes jambolana, and many others, give the landscape at the dryest season a picturesque verdant appearance, although from the habit the Bheels have of setting fire to the grass every season, the green jungle is not so continuous as on the Mahabuleshwur Hills.

7. I regret that I was unprovided with a Barometer to enable me to fix the altitude of this plateau correctly: the boiling point of water, with Thermometer immersed, gives an altitude of 4304 feet above the sea level to the lake, and 5434 feet to the hills about a mile and a half to the south east of the lake, and this I think will be found to be nearly the correct altitude.

8. I noted the variations of the Thermometer eight times daily during my stay, and although this was during the hottest period of the year, and I was living in a small rowtie open to the south-west and north-east, its greatest range was 89°, and least range 66°; the

mean temperature being 77°, and the daily range of variation being about 16°: during this time the Thermometer in a tent under shade with wet khuss tatties in the plains ranged from 88° to 105° daily.

9. There are about 40 Bheel families dwelling on the hill: they are scattered about in hamlets of five or six huts each, and rear a great number of cattle in the rich pastures of the lower table-land. They also cultivate small patches of wheat, indian corn, grain, tor, mor, [a species of rice,] bhurtee, &c.: each family only cultivates enough to suffice for its own wants, and therefore a great portion of the richest land is left uncultivated. The soil above the upper lake is a rich black alluvial deposit; on the higher plateaus it is a rich ferruginous clay, which would doubtless produce good crops of potatoes and wheat. The huts of the Bheel inhabitants are strongly constructed of interlaced bamboos, thatched with a species of coarse grass about ten feet in height, which grows in profusion on the sides of the hills. They are in the habit of descending to the markets of Tulloda and Shada, situated in the Sultanpoor Talooka: they carry down gums, lac, honey, bees-wax, dye-woods, charolee, [a species of sweet nut, &c.,] which they exchange for salt, spices, cloths, iron, &c. They are a very quiet, inoffensive, timid people, very different from the Bheels in the plains. Their head man is Goorkhia Naik, a fine old man, who has often rendered good service in assisting in the apprehension of desperate characters who have taken refuge in these remote fastnesses.

10. A Juttra takes place annually at Torun Mal in the month of January, in honor of Goorucknath: it had been discontinued until within the last few years, owing to the number of robbers who infested the jungles below; it is now attended by between 200 and 300 persons, chiefly from the west of Kandesh.

11. Remains of stone and brick buildings are found scattered all over the hills: a substantial stone wall, varying from ten to fifteen feet in thickness, has also been carried round the hills for many miles: it has been defended by round towers of most solid construction, and each of the three passes leading up to the table-land has been fortified by extensive works. All these are ascribed by the natives to the period of the Gowlee Raj, or Shepherds' Kings, to whom are ascribed all the works in the west of Kandesh—considered beyond the powers of the present race of inhabitants. These walls and for-

tifications are composed of blocks of stones piled up, without any mortar or chunam being used; the outward front is perfectly smooth; and this peculiarity of construction will be found in all works attributed to the period of the Gowlee Raj; as it also distinguishes all Etruscan walls in the ancient Cities of Italy. There is also a second, or inner wall, which appears to have been constructed at a later date—probably after the ruin of the original fortification, and was intended to prevent the ingress of wild beasts, and to keep cattle from straying. All these ruins tend to show that, at some early period, a very considerable population was located here.

12. There are three approaches to the Torun Mal; one leading from Kandesh, one from Burwani, and the third from Sindee and the Nurbudda. There is also a difficult foot-path from Dhergaum. On the Kandesh side, the road is very good for the first twenty miles from Shada; but for the last twenty, from the Bheel village of Charlee, it consists of a succession of steep ascents and descents. Tattoos with light loads can ascend; and the Banians from Shada bring up their supplies on donkeys. The road might be made much easier at a small expense. The pass leading to Sindee and the Nurbudda, which would be the road for people coming from Mhow and Mundlaisir, is also very steep and difficult for about three coss. The ascent by the Hiwassea Gate, from the direction of Burwani, is the easiest, and is easily surmounted by laden cattle.

13. The Bheels of Torun Mal appear very healthy: they state that there is no prevalent sickness during the rainy season; but that a large species of fly, with which these hills abound, is very troublesome to both men and cattle. Tigers are seldom heard of above the passes, although they are numerous in the plains below; and during my stay I did not observe a single noxious reptile or insect of any sort.

14. Game is plentiful on the hills; peacocks, jungle fowl, the grey partridge, quails, wild ducks, hares, wild cats, jackalls, foxes, and bears, are pretty numerous; the latter appear to ascend the table-land during the night, to feed off the wild fruits, and descend to the valleys in the morning. The Bison, or "Bos Gaurus," which abounds in the hills further west, towards Dhergaum, is said by the Bheels to ascend to the table-land during the rains, but

never remains during the dry season. Antelope and the civet cat are also found in the hills; and the Neelgae and Genus Cervus (the Sambre) in the valleys around.

15. The geological formation of these hills is composed of hard red sand-stone, iron stone, and masses of trap rock. On the east side, scarped masses of bare basaltic rocks, of a red colour, rise perpendicularly to a height varying from 400 to 600 feet; the deep valleys below are covered with thick jungle, and abound in peacocks and jungle fowl. From the lofty scarped projections, which, on this side, jut far out into the ravines, most extensive and romantic views are obtained over a vast extent of mountainous country towards the Nurbudda.

16. A great many trees and shrubs, unknown to the plains, are found on these hills; several produce edible fruits and berries, which form a considerable part of the food of the Bheel inhabitants; and several produce red and yellow dyes, which they carry to the neighbouring markets for sale. A variety of creeping plants entwine the branches of the larger trees, whilst mosses and lichens, the parasitic orchis, and the viscum opontiodes, strongly resembling the misletoe of Europe, tend to show the temperate climate compared with that of the low country.

17. Most of the inhabitants of this part of the Sathpoora range are a peculiar class of people, called "Pauria," although commonly supposed to be Bheels, and classed as such. They deny all affinity with the latter; and will neither eat nor associate with them. They worship "Waghded," or the tiger demon; they do not eat the flesh of swine or cows, and their manners and customs are quite different from those of the Bheel tribes. They speak a peculiar language, are very quiet and inoffensive, robbery and plunder being almost unheard of among them. Most of them have settled in these hills during the last few years, having emigrated from the Native States bordering the Nurbudda. In the Akranee Purgunna, the number of these settlers now amounts to 4268 souls; five years ago the number was 2570 souls; they pay to Government for the lands they cultivate a sum of about 2769 rupees annually.

18. There can, I imagine, be no question as to the salubrity of Torun Mal during the hot season; and that its invigorating climate would be a most beneficial change from the depressing heats of the plains. Although the Thermometer during this season averages about 20° lower than it does in the plains,—yet the elasticity of the atmosphere at this

height, and the vicinity of a fine sheet of water, cause the climate to be still more agreeable to the feelings than the degree of temperature would indicate. The only question therefore is, whether people would consider it worth the trouble to traverse the wild mountainous country by which Torun Mal is on every side surrounded, for the purpose of enjoying a temporary sojourn on its summit.

I have the honor, &c.

(Signed) C. P. RIGBY, Lieut.,
Western Bheel Agent.

CAMP AT SHADA, *April 28th*, 1849.

(Signed) ALEX. ELPHINSTON,
Collector and Magistrate.

(True Copy.) A. MALET, *Chief Secretary.*

Meteorological Observations at the Convalescent Station Mahabuleshwur, for the Month of April, 1849.

MAHABULESHWUR, 1*st May*, 1849.

Year 1849.	Atmospheric Temperature.			Atmospheric Humidity.		Weather.	
Date.	Maxim. 3 P. M.	Minim. 6 A. M.	Variation.	Mean depression of moist bulb therm.	Evaporation.	A. M.	P. M.
April.							
15	87	70	17	7	54	Clear during the day.	Clear during the night.
16	89	70	19	8	53	Do. do.	Do. do.
17	92	70	22	10	56	Cloudy at intervals during the day.	Cloudy. Thunder, Lightning, and Rain during the night.
18	90	69	21	11	60	Do. do.	Cloudy, and Lightning during the night.
19	89	68	21	12	52	Do. do.	Do. do.
20	89	70	19	10	60	Do. do.	Do. do.
21	88	71	17	6	55	Do. do.	Do. do.
22	87	69	18	5	54	Do. do.	Cloudy and Foggy during the night.
23	84	68	16	6	45	Cloudy. Thunder and Rain during the day.	Do. do.
24	75	64	11	7	40	Do. Passing Fog and light rain do.	Fog and Lightning.
25	73	65	8	8	41	Do. do. do. evening.	Do. during the night.

·10 of an inch of rain fell on the night of the 17th, and ·13 during the day on the 23rd.

Register of Thermometer at Torun Mal, noted in a small Rowtie open to the South-West and North-East.

Date.	At Sunrise.	9 A. M.	Midday.	3 P. M.	Sunset.	9 P. M.	Midnight.	3 A. M.	Mean of 24 hours.	Greatest variation.
April 15th...	68°	75°	82°	85°	80°	77°	74°	66°	75°	19°
April 16th...	69	77	83	86	84	79	76	66	77	20
April 17th...	69	83	89	89	86	81	78	67	80	22
April 18th...	74	82	87	89	84	80	79	78	81	15
April 19th...	74	75	84	84	82	80	78	77	79	10
April 20th...	70	74	82	85	83	80	79	73	78	15
April 21st...	72	80	83	88	84	82	80	70	79	18
April 22nd...	69	82	85	86	83	78	80	70	79	17
April 23rd...	72	80	84	86	80	78	70	74	78	16
April 24th...	68	72	81	82	80	75	70	70	74	14
April 25th...	67	70	80	82	79	74	70	68	74	15

April 15th.—Steady cool breeze from the North-West. Cold Westerly wind at night.

April 16th.—Clear sky—very calm. At about 2 P. M. cool Westerly breeze set in.

April 17th.—Cloudy weather and calm. No wind all day.

April 18th.—Cloudy weather, with light breeze at intervals. Heavy clouds at night, and slight rain.

April 19th.—Clear sky, with a fresh breeze from North-West at intervals. At night cloudy.

April 20th.—Cloudy—no wind. A slight shower of rain about 8 A. M.

April 21st.—Still cloudy morning. Occasional breezes from the West after midday.

April 22nd.—Cloudy sky, with cool breeze after midday from the West.

April 23rd.—Cool breeze blowing from the South-West all day. Cloudy sky.

April 24th.—Cold Westerly wind blowing day and night. Clear sky.

April 25th.—Cold Westerly wind all day and night. Clear sky.

(Signed) C. P. Rigby, Lieut.,

Western Bheel Agent.

List of the Principal Trees and Plants found on Torun Mal, and the neighbouring Hills.

No.	Names of Trees and Plants.	Uses to which applied.
1	Ficus Indica	
2	Ficus Religiosa	Produces gum and the coccus lacca.
3	Mimosa Chanda	Yields a resinous gum.
4	Butea Frondosa (Sanst. Pullus)	Its flowers used as a yellow dye, and its fruit as a purgative—yields gum.
5	Zizyphus Albens (Sanst. Torun)	Its fruit is greatly prized by the Bheels —it is peculiar to Torun Mal.
6	Carissa Carondas	Its fruit used as a pickle &c.
7	Ficus Glomerata	Its fruit used as food. Its wood affords good timber.
8	Tamarindus Indica	Ditto ditto.
9	Bassia Latifolia (Sanst. Madhusa)	Liquor is distilled from its flowers, which are also eaten when dried.
10	Zizyphus Jujuba	Its fruit eaten as food,—good hard wood.
11	Diospyros Glutinosa	Ditto ditto.
12	Feronea Elephantum	Yields a gum.
13	Butea Superba	A yellow dye and gum.
14	Teetona Grandis	
15	Khakur (native name)	Its fruit used as a pickle.
16	Calyptranthes Jambolana	Timber and fruit tree.
17	Terminalia Tomentosa	Its fruit used medicinally.
18	Zizyphus Napeea	An edible berry.
19	Cordia Latifoliæ	A fruit tree.
20	Mimosa Catechu	Yields a gum, which is used in dyes, and in making chunam.
21	Grislea Tomentosa	Used as a dye.
22	Chirongia Sapida	Its nuts are much prized,—used in confectionery, emulsions, &c.
23	Mangifera Indica	
24	Spondeas Mangifera	
25	Dalbergia Oopensis	Bark used in tanning.
26	Phyllanthus Emblica	Medicinal. Its fruit used as a pickle.
27	Erytherna Fulgens	
28	Dhamun (native name)	Good timber—its fruit eaten.
29	Koosum (native name)	Yields a red dye.
30	Sapindus Emarginatus (Soap-nut tree.)	Its fruit used as a substitute for soap, &c.
31	Giulandina Mounga	Its flowers used as a vegetable, its bark as a medicine.
32	Hibiscus Cananibus	Ropes made from its fibrous integuments, and oil expressed from its seeds.
33	Mimosa Sirisha	Timber tree.

(Signed) C. P. Rigby, Lieut.,
Western Bheel Agent.
(Signed) Alex. Elphinston,
Collector and Magistrate.
(True Copies.) A. Malet,
Chief Secretary.

Art. II.—*On Meteorological Curves.* By J. J. Waterston, I. N.

To the Secretary of the Geographical Society, Bombay.

Dear Sir,—Will you do me the favor to lay the enclosed sheet of Meteorological Curves before the Society. No. 1 is the graphical representation of the hourly observations for 10 days in April 1845. No. 2 is the same for the means of each day of June 1845. In each vertical line it will be remarked there is given the scale reading of the *simultaneous* phenomena that constitute the condition of the atmosphere at the time specified—Direction and force of wind—eighths of sky overcast—Temperature, wet and dry bulb—rain and electric disturbance—Barometric pressure on five times the scale of the mercury barometer. In the yearly observatory volumes published on the Royal Society's model, we have to turn over eight different sections before ascertaining the state of the weather at any given hour, and the local inquirer is further annoyed by the preference given to Göttingen time. We must not forget, however, that Magnetism, not Meteorology, is the chief object the Royal Society has in view in their *model* volumes.

When occasionally dipping into Meteorological tables, I have, as others no doubt may have, found the convenience, if not absolute necessity, of setting them into the linear form to make them intelligible, and to institute comparisons; and this is the arrangement I have found most convenient. There cannot be a doubt, I think, that the system of laying down observations in curves is the natural language of meteorology: we see it constantly had recourse to in a partial manner, but never adopted as a system, in preference to letter press, or MS., and never even thought of as proper for schedules. Yet how much useless labor would be saved if they were. What objections there are to its general adoption, I cannot imagine; everything is in its favor—in point of accuracy it is superior to letter press. The averages may be obtained from it with like facility, and in all other respects it seems infinitely preferable. I am sorry this is not the general opinion with us now when so great a mass of valuable observations are pouring into the Society: being strongly impressed with the advantages of adopting such a system in the schedules, which, I believe, are issued to the several observers who favor the Society with returns, I have drawn out and lithographed the accompanying sheet, so that it may be fairly brought to the notice of the Society. It

cannot fail to be remarked that we get at a glance a complete view of the weather, which I submit it is utterly impossible to obtain from the tables by any amount of attention.

The lines in this transfer are unfortunately not clearly brought out, but this might easily be remedied by first engraving them on copper and afterwards printing in lithographic ink on transfer paper.

I remain, dear Sir, yours truly,

BOMBAY, *June 21st*, 1849. J. J. WATERSTON.

Observations on Mr Waterston's suggestions as to graphic representations, with letter-press.

1.—There can be no doubt but that graphic representation is the natural language, not only of meteorology, but of a large body of the Physical Sciences; but, though natural, the meaning of it requires to be explained. I am not aware of any case in which it has been used from the first amongst any class, or at any time amongst the uninitiated, without the accompaniment o letter-press.

2.—One object we have in view is to have the knowledge we obtain as widely diffused as possible. Our own impression of 300 scarcely deserves the name of publication, and graphical representations are too difficult of dissemination to give us that notoriety for our work that is desired. There are very many other objections of the utmost weight that might be urged, into which I shall not at present enter. If Mr Waterston were aware of the labour required to get up observations such as we desire by the most simple and familiar machinery, he would scarcely think of introducing at the outset that which is new and complex, however beautiful. All our reductions, tabulation, &c., we can either get prepared by the observers themselves, or by common soldiers at Bombay, at the rate of two annas a page. The graphical representations must be entirely prepared for press by some one of ourselves.

3.—That they would form a most beautiful addition to our letter-press and tables, is beyond all dispute. As it may still be some time before any completed papers are in the hands of the Committee, so as to enable them to judge for themselves, I may here describe the plan that has hitherto been pursued by me.

4.—I have nearly completed a general dissertation on the History of Meteorological Researches in India, with separate histories of the work performed in this way for the past century at each presidency. This I purpose reserving till the detached Chapters are concluded.

5.—These consist of popular descriptions of the general climates of all the chief places in India where results have been furnished us as far back as documents extend. The Calcutta and Madras records go back for fifty years—those of Bombay for seven. This accomplished, I have next taken the climate of each place since 1847 so far as documents permit, and given an account in a separate Chapter of the Weather for each year, intermingling narrative with figure tables of abstracts. To this division of the work follows the tables in extenso of those stations only which have not published their own elsewhere. From those of Bombay, Madras, Lucknow, Trevandrum, Calcutta, &c., I take the short abstracts merely—Aden, Kurrachee, Porebunder, Vingorla, &c., are given at length. In some cases, as for example those of Calcutta, Lucknow, and Madras, the work has been passed by the observers on the spot into my hands almost ready for the press.

6.—These sections give the specific and characteristic phenomena for a term of years, and a single year due to each particular locality; and already the beautiful phenomena of pressure, dependent on season and on latitude, begin to develope themselves in inconceivable harmony.

7.—The great feature of our scheme is a comparison of the phenomena at different points with each other, and this includes for each year the drawing up of an account of the chief perturbations or crises which have occurred over areas of any considerable extent. For the full illustration of this division of enquiry, I am now preparing, ON MY OWN ACCOUNT, a series of Weather Maps, which I shall, I trust, be enabled very shortly to lay before the Committee.

8.—Very much of this would long ere now have been ready for the press had the assistance assured us by Government in 1847 been afforded us: as it is, the Society, which has from every station throughout India experienced the most prompt and cordial aid, has on the spot encountered the most persevering and systematic opposition.

9.—The result of this will be, that the account of the climate of Bombay, and the perturbations previous to 1819, will appear out of their proper place, and behind their time: this, so far as the Society is concerned, will now be, it is hoped, the extent of the evil. Of course to all these as many graphical illustrations will be added, in conformity with Mr Waterston's proposition, as circumstances will permit. And now to return to Mr Waterston's valuable drawing and suggestions.

10.—I forward a letter from Colonel Sabine, on the subject of the use of Gottingen time, which will I think meet Mr Waterston's views. He is mistaken in supposing the Bombay report a faithful copy of that of Toronto—the two accompany this, and will show that the corresponding local time given in the latter is omitted in the former, and all means and averages are left out: this adds to the perplexities of which Mr Waterston complains. The book, however, so abounds with inaccuracies, that that which is here alluded to is amongst the least of its imperfections.

11.—As the Royal Society provided ruled schedules, when in charge of the Observatory I had these filled up as forwarded, but I kept a separate meteorological record of my own, where local time was adopted, and on this the provisional report was drawn up. A copy of the report, as well as of the register, accompanies this. When constant hourly observations are kept without interruption, it matters less what time is observed, provided fractions of hours are avoided, as one kind of reckoning can easily be converted into another. In all other cases, civil time, the day beginning at midnight, is that which is most convenient, as being most generally understood. In hourly barometric observations not extending beyond twenty-five hours, it seems far the best to begin with the morning minimum of 3 A. M., as we are by this means supplied with the unbroken double curve of the twenty-four hours in its most symmetrical form.

12.—Of the expediency of giving the pressure curves for each day of the year, as represented by Mr Waterston, there can be no doubt—just as little unfortunately of its difficulty and expense. I have endeavoured to work out so much of it already—to curve the monthly, quarterly, and yearly means, and the anomalous or perturbation readings. In the rough record now circulated, but which is very clumsily and not uniformly kept, every day of the year for eighteen months, Sundays included, is curved, twelve ten-minute readings being taken at each of the four turning points. It would have been an improvement certainly had the curves been continuous—on one long sheet—in place of each curve occupying a separate plate.

13.—In the provisional report a plan will be found resorted to which is, so far as I know, new, and is a very great saving of expense and trouble, were the people here able to work it out. The great labour in all these things is the drawing of the same sets of lines, and marking down the same sets of figures and headings on each paper—constructing the diagrams in comparison are very simple matters.

14.—To overcome this I had a series of copper plates engraven, partly here and in part at home, containing everything that was fixed and uniform: these were charged with lithographic ink, and printed on transfer paper. Here the lines, diagrams, or changeable matter, was written in with the pen, and the whole transferred to stone and printed.

15.—To my extreme mortification I find that this cannot at present be done at Bombay: I have however written home for a description of the process, and receipt for the ink; and should we here prove more successful, a plate such as that required by Mr Waterston, with the outlines

engraved on it—leaving the variable matter to be filled in—might perhaps be obtained, and prove serviceable, in addition to our letter-press.

16.—I herewith forward some of the graphic delineations* which have already been published—from which it will be seen how much depends, in giving effect to them, not only on the skilfulness of their design, but the beauty of their execution:—whatever we may have to boast of in the former of these, our inferiority in the latter is too notorious to be denied.

I have the honour to be, gentlemen, your most obedient servant,
BOMBAY, *6th July*, 1849. GEORGE BUIST, Secretary Geographical Society.

ART. III.—*Notes on the Meteorology of the Sattara Territory for* 1848. By Assistant-Surgeon MURRAY, Residency Surgeon at Sattara.

No. 3112 of 1849.

From A. MALET, Esquire, *Chief Secretary to the Government of Bombay,*
To GEORGE BUIST, Esquire, LL.D., *Secretary to the Geographical Society.*
Dated 23rd July, 1849.—*Political Department.*

SIR,—I am directed by the Right Hon'ble the Governor-in-Council to transmit to you, for presentation to the Members of the Geographical Society, an Extract paragraph 35 from a letter from Dr. MURRAY, on special duty at Sattara, to the Commissioner at that place, dated the 31st December 1848, with copies of the Notes therein alluded to, on the Meteorology of the Sattara Territory during the past year.

I have the honor to be, Sir,
Your most obedient servant,
BOMBAY CASTLE, *23rd July*, 1849. A. MALET, *Chief Secretary.*

No. 6.

THE following Table exhibits the Monthly Means and Extremes of Temperature and Rain-fall, as observed in the Town and Cantonment of Sattara during the past year. The out-door temperatures in the shade are taken from a Thermometer suspended in the eastern veranda of the Town Hospital, a lofty tiled building; while the in-door observations may be useful in shewing the degree of temperature which can be preserved in a thatched Bungalow in the Cantonment, which is closed and screened during the heat of the day in the hot season, partially shut up on the east side in the cold months, and kept open during the monsoon:—

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* LUKE HART'S "*Climate of London.*"—Reports of the British Association.

Tabular View of the Meteorology
Lat. 17° 40′ N., Long. 74° 2′ E.

Months.	Out-door Temperature in the Shade									In-door		
	Means.					Extremes.				Means.		
	Mean Temperature.	Mean Daily Variation.	Mean Daily Maximum.	Mean Daily Minimum.	Difference of Mean Temperature of successive months.	Extreme Daily Variation.	Extreme Monthly Variation.	Extreme Maximum.	Extreme Minimum.	Mean Temperature.	Mean Daily Variation.	Mean Daily Maximum.
	°	°	°	°	°	°	°	°	°	°	°	°
January...	70·1	19·1	80·2	61·1	0·6	22·0	26·0	83·0	57·0	69·5	7·0	73·5
February.....	76·5	20·6	86·8	66·2	6·4	24·0	33·0	93·0	60·0	72·9	8·2	77·0
March...	81·5	21·5	92·3	70·8	5·0	26·0	36·0	98·5	62·0	76·6	7·2	80·2
April...	86·1	19·9	96·1	76·2	4·(	24·5	34·0	101·0	67·0	80·3	6·4	83·5
May.....	86·3	20·6	96·6	76·0	0·2	26·0	34·0	104·0	70·0	80·7	8·2	84·8
June.....	76·7	8·9	81·2	72·3	9·(	19·0	21·0	90·0	69·0	76·3	3·8	78·2
July.....	76·5	12·9	83·0	70·1	0·2	27·0	30·0	95·0	68·(	74·6	3·8	76·5
August.....	72·5	7·1	76·1	69·0	4·0	20·0	20·0	86·0	66·0	73·0	2·9	74·5
September..... ...	75·9	13·5	82·7	69·2	3·4	20·0	24·0	90·0	66·0	74·9	5·6	77·7
October.....	75·5	9·8	80·4	70·6	0·4	12·0	13·5	83·0	69·5	75·(	4·7	77·4
November...	71·7	13·1	78·3	65·2	3·8	20·5	20·5	81·5	61·0	71·7	4·8	74·1
December...	70·8	15·0	78·4	63·0	0·9	18·0	21·0	81·0	60·1	69·3	7·4	73·0
Annual Means & Extremes.	76·7	15·2	84·3	69·1	3·2	27·0	36·0	104·0	57·0	74·5	5·9	77·5

From the foregoing table, it appears that the mean annual out-door temperature in the shade, for the past year, has been 76° 7′, with an average daily range of 15° 2′. A comparison of these results with those of previous years, shews that the mean annual temperature has been 2° 3′ higher than that of 1847, and 0° 7′ in excess of the average of the last four years, with an increase of 1° 7′ in the mean daily range of the Thermometer.

The excess of heat chiefly occurred in the monsoon months, and arose from the deficiency of rain, which will be hereafter more particularly noticed.

of Sattara, for 1848.
Altitude 2320 feet.

Temperature.						Rain-fall.					Winds.	
		Extremes.										
Mean Daily Minimum.	Difference of Mean Temperature of successive months.	Extreme Daily Variation.	Extreme Monthly Variation.	Extreme Maximum.	Extreme Minimum.	Total Fall.	Day Fall.	Night Fall.	No. of Rainy days.	Extreme Daily Fall.	Direction.	Force.
°	°	°	°	°	°	Ins.	Ins.	Ins.		Ins.		
65·5	0·3	11·0	16·0	75·5	59·5	—	—	—	—	—	E S.	
68·3	3·4	10 0	18·5	80·5	62 0	—	—	—	—	—	S.E.—S.W.	Modte.
73·0	3 7	11·5	17·0	84·0	67·0	0·04	0·04	—	1	0·04	E.S.W.	—
77·1	3·7	11 0	14·8	87·8	73·0	0·76	0·72	0·04	4	0·35	N.E W.	Modte.
76·6	0·4	11·0	13·5	87·5	74·0	2·79	1·83	0·96	5	1·49	... ...	—
74·4	4·4	8·0	8·5	81·5	73·0	3·26	2·19	1·07	8	1·00	W.	Vble.
72·7	1·7	9·0	10·5	82·0	71·7	12·02	5·30	6·72	20	1·97	W.W.S W.	Modte.
71·6	1·6	6·0	6·5	77·5	71 0	2·55	1·37	1·18	19	0·43	W.S.W.N.W.	Fresh.
72·1	1·9	8·0	10·5	80·5	70 0	1·40	1·13	0·27	6	0·55	N.W.W.W.S.W.	—
72·7	0·1	7·0	10·0	80 0	70·0	3·28	1·81	1·47	9	1·58	W to E.	—
69·3	3·3	9·5	14·0	76 5	62·5	1·71	0·74	0·79	6	0·92	W.E.S.	Vble.
65·6	2·4	11·0	15·6	75·5	60·5	—	—	—	—	—	—	Modte.
71·6	2·2	11·5	18·5	87·8	59·5	27·81	15·13	12·68	78	1·97		

In the Eastern Districts, a Meteorological Register has been kept at Beejapoor throughout the year, and at Punderpoor for the last seven months of the year.

The following is an abstract of the Register kept at Beejapoor. The temperatures are taken from a Thermometer suspended in the interior of an unoccupied terrace-roofed building, quite open in front. They give a mean annual temperature of 81·7, being 5° higher than that of Sattara. The mean temperature at Punderpoor for the seven months is 1° higher than that of Beejapoor during the corresponding months of the year :—

Tabular View of the Meteorology of Beejapoor, for 1848.

Months.	In-door Temperature in the Shade.									Rain.				
	Means.					Extremes.								
	Mean Temperature.	Mean Daily Variation.	Mean Maximum.	Mean Minimum.	Difference of Mean Temperature of successive months.	Extreme Daily Variation.	Extreme Monthly Variation.	Extreme Maximum.	Extreme Minimum.	Total Fall.	Day Fall.	Night Fall.	No. of Rainy Days.	Extreme Daily Fall.
	°	°	°	°	°	°	°	°	°	In.	In.	In.		In.
January	78·7	8·5	83·0	74·5	0 5	9·0	10·0	84·0	74·0	—	—	—	—	—
February	75·3	10·7	84·5	73·8	3·4	13·0	17·0	87·0	70·0	—	—	—	—	—
March	84·8	11·5	90·6	79·1	9 5	15·0	18·0	95·0	77·0	—	—	—	—	—
April	88·4	10·8	93·8	83 0	3 6	14·0	18·0	96·0	78·0	—	—	—	—	—
May	88·5	9·2	93·1	83·9	0 1	11·0	15·0	96·0	81·0	—	—	—	—	—
June	85·0	5·5	88·2	82·7	3 6	7·0	7·0	89·0	82·0	0·80	0·80	—	3	0·61
July	81·2	6·8	84·6	77 8	3·8	10·0	14·0	87·0	73·0	3·67	1·19	2·48	8	1·39
August	78·7	9·8	83·6	73·8	2·5	11·0	13·0	85·0	72·0	8·52	2·01	6·46	8	3·01
September	78·2	10·0	83·2	73 2	0·5	11·0	15·0	86·0	71·0	4·01	0·34	3·57	9	1·07
October	79·6	9·4	84·4	75·0	1·4	11·0	12·0	86·0	74·0	4·64	1·21	3·43	7	1·28
November	76·7	9·1	81·3	72·2	2 9	11·0	14·0	84·0	70·0	3·78	1·47	2·31	4	1·87
December	79 2	8·5	83·5	75 0	2 5	9·5	10·0	84·5	74·5	—	—	—	—	—
Annual Means and Extremes.	81·7	9·1	86·9	77·0	2 8	15·0	18·0	96·0	70·4	25·42	7·17	18·25	39	3·01

During the past year, registers of the Pluviometer have been kept at thirteen different places within the Sattara Territory—1 on the range of the Ghats,* 7 in the western districts, and 5 in the eastern districts. The results of these observations are embodied in the following Table:

Comparative Fall of Rain at different places in the Sattara Territory during 1848.

Months.	Ghauts.		Western Districts.								Eastern Districts.					
	Mahableshwur		Meera.	Bantashwar.	Sattara Fort.	Sattara.		Bhore.	Wye.	Phultun.	Jhutt.	Beejapoor.	Pundeerpoor.	Akulkote.		
	Sanatarium.	Sindola.				Town.	Cantonment.									
	In.	In.	In.	In	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.		
January	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
February	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
March	—	—	—	—	—	0·80	0·04	—	—	—	—	—	0·75	1·63		
April	—	—	—	—	—	0·74	0·76	—	2·09	6·24	—	—	2·02	3·68		
May	3·69	3·60	2·75	2·60	2·50	3·04	2·79	2·10	2·20	4·39	1·59	0·80	4·38	4·65		
June	58·22	41·70	10·93	5·98	4·10	3·71	3·26	2·37	9·05	2·70	3·07	3·67	6·21	4·83		
July	96·28	74·28	22·90	19·83	18·77	14·64	12·02	13·20	1·61	1·24	4·82	8·52	4·35	2·84		
August	63·95	47·81	6·16	6·02	5·00	2·60	2·55	5·19	0·96	3·57	2·64	4·01	8·35	5·32		
September	9·48	6·17	2·30	1·80	1·46	2·14	1·40	0·91	2·57	2·45	3·88	4·64	2·49	2·30		
October	9·31	7·25	2·75	2·27	4·64	4·89	3·28	1·50	2·25	3·39	2·17	3·78	—	—		
November	4·08	4·37	1·85	0·19	2·91	1·57	1·71	4·15	—	—	—	—	—	—		
December	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Total Annual Fall.	245·01	185·16	49·64	38·69	39·38	33·41	27·81	29·42	20 73	24·18	18·17	25·42	28·55	25·45		

* To the Ghaut Observations I have prefixed, for the purpose of comparison, those made at the Mahabuleshwur Sanatarium, for which I am indebted to the Superintendent of the station.

Looking at these results generally, it is to be observed, that there has been an average fall of rain on the Ghats during the year, while the fall in the western districts has been below, and in the eastern districts above, the average amount of former years.

The effect of local position in determining the amount of rain, is strikingly exemplified in the two series of observations at Mahabuleshwur. At the Sanatarium, elevated 4,500 feet, the rain-fall during the year amounted to 245 inches, being within three inches of the average fall during the preceding twenty years.* At Sindola, the residence of Mr Frere, situated a mile east from the Sanatarium, about 100 feet higher, with the intervening eminence of Mount Charlotte rising to a further height of 100 feet, the quantity of rain did not exceed 185 inches during the same period. Here we have a difference of 60 inches, or 24 per cent, at two houses situated at the same station. The position of the ground explains the difference: but probably few people, on examining the two localities, would have anticipated its amount. It shews the supreme importance of instituting multiplied observations, before deciding on the site of a sanatory hill station.

There has been a deficient fall of rain at Sattara, as in other parts of the western districts,—the amount being 12 inches below the average of the preceding four years. After three thunder-showers in the first week of April, and five heavier ones in the latter half of May, the south-west monsoon set in at the period of new moon on the 1st of June. It commenced with dense rain on that day, and again on the 4th. A second fall took place for five days in the middle of the month; the total amount falling short of the usual fall by one-half.

In the early part of July, there was a complete break in the monsoon —sultry weather, with occasional lightning and appearance of thunder, and south-easterly winds. On the night of the 11th, there was a heavy thunder-shower from the south-east, and the weather closely resembled that of the breaking up of the monsoon. On the morning of the 14th, however, (first day of full moon springs), there was a fresh setting in of the monsoon from W. S. W., and the rain continued very constant and very general for twelve successive days, with subsequent light showers daily to the end of the month.

* The annual average fall of rain from 1829 to 1848 inclusive, has been 248½ inches.

Scarcely four inches of rain fell in the two following months. The complete absence of thunder, except in the distance, formed the most remarkable feature in the Meteorology of October: and indeed, there was no near thunder subsequent to the 25th of May. Rain fell on six days in November, and falling as it did so late as the 21st of the month, proved injurious to the rubbee crops.*

The character of the season in the other Western Districts, resembled that at Sattara, with differences in the quantity of rain corresponding with their respective elevations and distances from the Ghauts. At Meera in the Yenna valley, midway between the Mahabuleshwur Hills and Sattara, it amounted to 49½ inches, while ten miles lower down, on the Hill of Entashwar, which forms the western boundary of the valley, and rises about 1,500 feet above its level, it did not exceed 38½. At Bhore, near the head of the Meera valley, the fall approximates very closely to that at Sattara. At Wye, again, in the upper part of the Krishna valley, there is a decrease of 7 inches.

In the Eastern Districts, as already stated, the monsoon has been unusually plentiful. The yearly fall did not quite equal that at Sattara; but the quantity measured in the months of August, September, October, and November, was double that which was registered at Sattara in the same months. Hence the crops, which have been below the average in the Western valleys, have been very abundant in the Eastern districts.

(Signed) J. MURRAY, *Surgeon.*

(True Copies.) A. MALET, *Chief Secretary.*

ART. IV.—*Notes on the Meteorology of the Phoonda Ghaut.* By Captain E. P. DELHOSTE, Bombay Army.

THE difference between the two stations on the Ghaut is very great. In the one, the dense fog renders the climate damp and disagreeable. In the other, the fog is very much less *felt*, although it is *seen* all around at a short distance following the hills. The slope of the ground is considerable; and rain does not lodge but runs off rapidly, so that half an hour after the heaviest shower the roads are dry. The river rose to 12 feet 4 inches, and had I not cut away the trees and bushes on the banks, would have done mischief: as it is, some injury has been done to the drains and bridges, but not much. The Ghaut has stood well, by constant care in keeping the road well drained, and removing stones and earth that fall from the sides: the road has been perfectly pre-

* The showers of the 7th, 8th, and 14th, of January (1849), were still more injurious to the crops.

served hitherto. The house is far more dry than most of the houses in Bombay, and altogether I do not think that a better climate for Natives and Europeans could be found in Western India. The new road towards Kolapoor has opened a country where the soil is rich, and the Natives have commenced cultivating on each side of the road from the bazaar to the first stage *already*, a distance of 13 miles from hence to Phuralla.

The difference between the Thermometer rise and fall in the house, and outside in the veranda, has been found to be 3° : where 71° in the house, it was 68° in the veranda.

EDWARD P. DELHOSTE, *Captain,*
PHOONDA GHAUT, 1*st July*, 1849. *Asst. Qr. Mr. Genl., on special duty.*

Meteorological Journal, kept on Top of Phoonda Ghaut, in June, 1848.

Date.	Thermometer. M.	N.	E.	Fall of Rain in Inches.	Morning.	Noon.	Evening.
1	73½	75	73½	½	Cloudy, but fair.	Light Showers.	Light Showers.
2	72¼	74½	71	2	Rain & Fog.	Rain & Fog.	Rain & Fog.
3	71¾	72¼	71	1	Foggy.	Rainy.	Rainy.
4	70	75	73¾	¼	Heavy Rain & Fog.	Fair.	Light Showers.
5	71½	74	74	¼	Fair, Misty.	Wind & Rain.	Showers.
6	73	77	74¾	¼	Thick Fog.	Fair, Sunny.	Cloudy.
7	72¼	77	74	0	Ditto.	Ditto.	Fair Weather.
8	73	76¾	74½	0	Ditto.	Pretty fair.	Ditto.
9	72	78¼	74	8	Heavy Rain	Rain.	Rain.
10	72½	74½	71¼	¾	Fair, calm.	Fair.	Ditto.
11	72½	74½	72	3	Misty.	Ditto.	Showers.
12	71¾	75¾	73	¾	Dense Fog.	Ditto.	Rain & Fog.
13	72	75	72	3	Rain.	Ditto.	Fair.
14	70¾	71¾	71	3¾	Ditto.	Rain & Wind.	Heavy Rain.
15	70½	71	71½	5¾	Rain & Fog.	Rain & Fog.	Ditto.
16	71	73	72¼	2¾	Misty, Rainy.	Heavy Rain.	Ditto.
17	71¼	73¾	72	3¼	Rain & Fog.	Wind & Showers.	High Rain, fair.
18	68½	72	72	7	Heavy Rain & Wd.	Rain & Wind.	Wind, Fog, Shower.
19	71	72½	71¾	3¼	Very high Wind.	Thick Fog.	Rain.
20	71	71¾	71½	2¼	Light steady Rain.	Fog & Wind.	Fair Weather.
21	71	71	71	1	Wind & Rain.	Fog.	Slight Fog.
22	71¼	73	71½	1¾	Light Rain.	Fog, calm.	Mist, sunny for ½ hour.
23	72	73¼	71¼	1¾	Ditto.	Calm.	Sun v'ble for few min.
24	71½	74	72½	2	Light Showers.	Sunshine.	Rain
25	71¾	73	73	1¾	Light Rain.	Ditto.	Fair, sunny.
26	71¾	74¼	71¾	¾	Sunshine, Rain.	Showers.	Fog, Sunny, & Sh.
27	72	74	73	½	Foggy & Sunny.	Sunshine, Fog.	Fair & clear.
28	72	74½	72	0	Fair Sunshine.	Showers, Sunny.	Fair weather.
29	72	75½	72	0	Foggy.	Sunshine.	Fine breeze, clear.
30	71½	74	72½	1½	Light Rain.	Sunny, Showers.	Heavy Clouds.

Highest 78¼°—lowest 68½°—Mean 73°.—Total Rain, 56 inches.

Meteorological Journal, kept half a mile from Top of Ghaut, Deccan side, June 1849.—240 *feet lower than Top of Ghaut.*

Date.	Thermometer. M.	N.	E.	Fall of Rain in Inches.	Morning.	Noon.	Evening.
1	78	76	77	1¼	Cloudy, but Rain.	Rain.	Heavy Rain, T. L.
2	75	79½	78	1¾	Fair & clear.	Fair, clear, rain.	Rain T.
3	74	79	78	2½	Calm, cloudy.	Calm, clear.	Rain T. L.
4	74	77	75	1	Light Rain.	Light Rain.	Showers, fair.
5	74½	78¼	76	1¼	Fair, light showers.	Fair, sunny.	Fair, Rain T.
6	75	77	76	1½	Light Rain, fair.	Light Rain.	Light Rain.
7	74	75	75	½	Fair.	Ditto.	Ditto Wind.
8	73	75½	75	3½	Showers & Wind.	Heavy Showers fair.	Heavy Showers and wind.
9	71½	76	74	1	Light showers, fair	Ditto.	Heavy Rain & Wind.
10	74	75	75	1	Wind & Showers.	Showers & fair.	Showers & fair.
11	74	75	75	¾	Sunshine.	Rain & Thunder.	Heavy Rain, Sunshine.
12	69	78	75	4	Fair, cloudy.	Sunshine, fair.	Fair, Rain.
13	73	74	74	2¾	Rain & Fog.	Continued Rain.	Heavy Rain, Wind.
14	73	74	74	1¾	Rain, slight Fog.	Ditto.	Rain.
15	73	74½	74½	2¼	Rain & Fog.	Rain.	Ditto.
16	72	74½	74½	1	Ditto.	Rain, fair.	Ditto.
17	72	73	73	1½	Ditto.	Ditto.	Fair, a little sunshine.
18	72	73	73	3	Rain, fair.	Rain.	Rain.
19	73	73½	73½	2¼	Rain & Fog	Rain, dense Fog.	Rain, Fog, Wind.
20	74	74½	74	4¼	High Wind, Rain, Fog.	Fair, Wind, Sunshine.	High Wind, Rain.
21	74	74⅛	74¾	1½	Ditto.	High Wind, Rain, Fog.	Wind, Rain, Fog.
22	74½	74¾	74¾	4¾	Wind, light rain.	Rain & Fog.	Ditto.
23	74	74¾	74¾	4½	Continued rain, fog	Rain, Fog.	Rain, Fog.
24	74	75	74	5	Light Rain, Fog.	Calm, rain.	Calm, clear, rain.
25	73	74	74	3	Calm, light rain.	Calm, light rain.	Calm, rain.
26	73	74	74	2¾	Ditto.	Calm, fair.	Heavy Showers.
27	72	75½	74	4¼	Fair, sunny.	Sunny, fair.	Showers.
28	73	71	74	3½	Rain.	Rain.	Rain.
29	73	74	74	5	Calm, Fog & Rain.	Rain & Wind	Rain, Wind, Thunder.
30	73	73	173	1½	Calm & Rain.	Ditto.	Rain, fair, & wind.

Total... 75

Last year... 56

Inc. in this year 19

19, 20, 21, 22, 23. Heavy weather—a storm in fact. Rivers overflowed, and whole valley a lake. Barometer has varied between 27·950, 28·000, and 28·105.

EDWARD P. DELHOSTE,
Captain, Asst. Qr. Mr. Genl.

ART. V.—*Notes on the Climate of Peshawur, from April to August, 1849; and on the Cold Wells in the neighbourhoood.* By J. P. MALCOLMSON, Esq., Surgeon, 3rd Bombay N. I.

GENERAL REMARKS.

APRIL.—I regret I had not a Pluviometer to enable me to ascertain the quantity of rain that fell during this month, which must have been considerable. Scarcely a day passes without heavy rain falling in the neighbouring hills, giving rise to a number of mountain streams of considerable size,—these rivulets ultimately falling into the Cabool river, which joins the Indus a short distance above Attok. The cultivators of the soil lead the water from the streams all over the plains of Peshawur for the purpose of irrigation. The streams continue an abundant supply of water during the hottest seasons. Every field has its rivulet: one of considerable size flows through the centre of the city; the banks in many parts ornamented with the mulberry and willow trees.

The inhabitants seldom use well-water for culinery purposes; they say the running water is more wholesome. There may be some truth in this: tradition often arises from long observation, and is frequently founded in fact, however facts may sometimes become obscured by time.

MAY.—The hot weather may be considered to have commenced on the 6th: since then, the heat has been increasing, with a continued haze, which may not inaptly be called "a fire mist." The days and nights have been cloudless, with a scorching hot wind carrying clouds of impalpable dust into every crevice of drawer and box. The prevailing wind during the hot season at Peshawur is west, and becomes heated by passing over the bare rocky mountains in that direction; and then sweeps over the plain of Peshawur, withering up every green thing. The nights have hitherto been cool, with but two or three exceptions, when the hot wind continued all night. Many of the troops, both European and Native, are still under canvas; and fever is becoming very prevalent—it is the bilious remittent fever of hot climates, but attended with a greater determination of blood to the head than I have ever before observed even at Aden, where the heat is intense. A great number of officers are in the sick report from fever; and several will be obliged to leave for the sea coast as soon as practicable. We have as yet lost but few men and officers.

JUNE.—The maximum range of the Thermometer during the month in an open house, not artificially cooled, has been 109°, and in an open single-poled tent 111°, minimum 80°, and medium 90¼°. Up till the 22nd of the month the heat was very oppressive, with hot wind and frequent dust storms, which often continued throughout the night. During this period bilious remittent fever was prevalent amongst the troops: Europeans and Natives, officers and men, suffered equally—in fact hardly an officer escaped an attack : and owing to the debilitating effects of the great heat, convalescence has been in every instance slow. Four officers have been obliged to leave on sick certificate during the month for the sea coast.

About the 22nd, a very agreeable and favorable change took place in the state of the weather. From that time till the end of the month thunder-storms in the surrounding hills have been of daily occurrence, restoring the electric equilibrium between the earth and atmosphere ; and as a natural consequence, the air became much cooler and more elastic ; sickness diminished ; and even vegetation assumed a more healthy aspect.

The late atmospheric irregularities and disturbances, and unsteady state of the wind, seem to indicate that a severe storm has occurred some where at no great distance—probably in the Arabian Sea : the want of a Barometer is much felt here, without which no accurate journal of Meteorology can be kept. Atmospheric phenomena are now attracting the attention of the most scientific and learned men of the age.

It is to be hoped that the Indian Government, with their usual liberality and wish to encourage everything that is useful, will cause a few philosophical instruments to be supplied to the station at Peshawur, and have them placed under the direction of some competent person. By a little attention to these matters, a mass of very useful information might soon and easily be collected, of the utmost interest to science, and conducive to the health of the troops and interest of Government. In a philosophical point of view, Peshawur is highly interesting as being the extreme limit of the British possessions, and bordering on what may be called a volcanic region.

JULY.—The heat of July has been less than that of June, with a good deal of cloudy weather, which may in part account for the difference. The nights during nearly the whole month have been cool and refreshing, and thus enabled the languid feeling and exhaustion occasioned by the high temperature of the day to be recruited by sound and refresh-

ing sleep. Neither have the mosquitoes or sand-flies been so troublesome as in the former months. Sickness amongst the troops, particularly the Natives, has been on the decrease. Bilious fevers, of the remittent and continued type, have been the most prevalent diseases amongst the European portion of the force, and a few casualties have been the consequence. H. M.'s 61st Regiment have lost two officers during the month; the 60th Rifles and Fusiliers a few men each: but on the whole, the month of July may be said to have been healthy, and not characterised by any particular or unusual disease or class of diseases. Amongst the Europeans, two or three fatal cases have occurred from what is called "apoplexy" of the lungs, formerly known under the name of congestion. It is occasioned by hot, close, rarified air, which renders it unfit to effect that change in the blood, during its passage through the lungs, so essential to life. Crime amongst the troops has been of a trifling nature.

I believe it is not generally known that there are Cold Wells at Peshawur, the water in which retains the uniform temperature of 58° of Fahrenheit's scale throughout the whole of the hot season. There are several of those wells, but only one in the City belonging to a mosque,—the others in the immediate vicinity of the town. I will here confine my remarks to the former, which is known by the name of 'Ali Buksh,' so called after a man of that name who built it. The well is frequented by the inhabitants more than any of the others, as the water is clearer, and the locality more central than the others.

The well is sunk through fertile alluvial soil, composed of alumina, siliceous sand and lime, with no animal and very little vegetable admixture. The sides are built of burnt brick and strong cement—depth eighty-six (86) feet, fourteen of which are water; diameter nine (9) feet. I have taken the temperature of the well on several successive days, in the morning at sunrise, when the thermometer stood at 72°; at noon, when it stood in the shade at the well's mouth 115°; and in the evening, when it was 95°; but found the water drawn from the well invariably 58°. The water is clear, sweet, and sparkling, as if it contained a portion of carbonic acid gas.

The only information which the inhabitants can give of the well, and the supposed cause of the coldness of its water, is the following, and the more intelligent Moolahs can give no further elucidation of the circumstance,—vague and erroneous as I believe it to be.

During the cold or winter months, when frost frequently appears, a stream from the Bara river is turned into the well till it is filled. This, it would appear, subsides in a few days, when the operation is repeated three times. After this, beams of wood are laid across the mouth of the well: on these, mats and branches of trees are laid; the whole is then earthed up. The depth of these are four feet.

It is afterwards left undisturbed till the hot weather, when it is opened to the public, and the water is found to be of the low temperature of 58°. This water is found to be far more refreshing than water artificially cooled.

A draught is truly the greatest luxury which Peshawur can afford: nor is there the least danger in drinking copiously of it, however heated or exhausted the individual may be from the effects of the weather. Water at this low temperature when taken internally is a most powerful tonic, and highly beneficial in a variety of diseases. The water is perfectly free from any smell or saline taste, which many of the wells in the city and plain are not,—as they taste and smell strongly of sulphuretted hydrogen &c.

To arrive at anything like a correct knowledge of these wells, would require a series of close and continued observation during both the hot and cold period of the year. The inhabitants are firm in the belief that it is the water which has been admitted into the well as before remarked, which affords the supply drawn up during the hot months. This I can in no way admit, as, in the first place, the quantity admitted would be quite inadequate for such a purpose: besides, the depth of water in the well never obtains a greater height than fourteen feet. I am now of opinion that the low temperature of the water is the permanent temperature of the ground at that depth: when we make a perforation into the earth till we arrive at a depth below fifty or sixty feet, the temperature will remain unchanged. If this perforation is made during winter, when the thermometer, we will say, stands at zero, the heat will increase till we arrive at the limit, say 53°; but if we try the experiment in summer (the hot months at Peshawur,) when the thermometer, for instance, stands at 112°, we will experience an increased degree of cold, till we reach the limit 53°. We therefore conclude that at certain depths the earth ever retains the same permanency of heat.

The water which supplies the well certainly percolates through the substrata, and is probably the result of melted snow, which thus finds its way through chinks in the snowy range of hills, and rises in different points in the plain of Peshawur, which has certainly once been an extensive fresh-water lake. Indeed, there is one large spring of very cold sweet water, which bursts out in a small ravine about two miles to the north-west of Peshawur, evidently fed, as also the wells, by subterranean currents of water.

It becomes a subject of great importance now, for it may be practicable to construct wells in the projected new cantonments capable of affording an ample supply of cold water in the hot months. It would be a matter of very great moment, in the treatment of fevers, and other acute diseases to which Europeans are liable in hot climates, to have such wells close to the hospitals.

I have made enquiries on the subject, and expense of constructing similar wells, and believe they would not be more than five hundred rupees each.

August.—The month of August has not been characterised, as indicated by the thermometer, by an extraordinary degree of heat beyond the months of May, June, and July. The thermometer even shows that the mercury did not range so high as in those months; yet more fatal cases of apoplexy have occurred amongst the European troops in August than in any former month since the occupancy of Peshawur by the British. In the middle of the month we had a succession of exceedingly close and suffocating nights, and in the space of three days we lost twelve Europeans from apoplexy alone, called by the medical officers in whose corps the casualties occurred, "apoplexy of the lungs." Several died in their beds in the barracks, during the night, without any previous indisposition, or their comrades being at all aware of the circumstance.

Sickness is now on the decrease amongst both Europeans and Natives. The latter part of the month has certainly been getting cooler, and the hot weather may be said to be fairly over. The nights and mornings are very delightful, and as such enjoyed by all, particularly by those who have been invalids, and suffering from the effects of great heat.

Thunder-storms, with rain, have been of frequent occurrence during the month, each succeeded by a cooler state of the atmosphere for several days. These thunder-storms, even though no rain is precipitated, act

as so many cold streams or pulses attracted by the hills, and thence by their specific gravity, roll down into the valley, reducing the temperature of the scorched plains : they also relieve the surcharged atmosphere of part of its electricity,—the unequal distribution of which is now generally admitted to be productive of some, if not all, of the most destructive epidemics. These phenomena are still involved in great obscurity, and nearly all that we can do in elucidation is to accumulate facts for future deduction and generalization.

During nearly the whole month there has been a beautiful display of brilliant meteors—red, blue, and green—in the lower regions of the atmosphere. I have frequently counted as many as twenty in an hour—direction principally from North-west to South-east, but often to and from other points of the compass.

With reference to some remarks on the Cold Wells of Peshawur, in the report for July, I would here add, that I have since read Burnes's Travels to Bokhara. In the 3rd volume, page 137, the following passage attracted my attention :—

"Between Bokhara and the Oxus, the water exudes through sand, "and in August, had the temperature of 60° while the air exceeded that "of 100°. It was as grateful to the palate as if cooled in ice. In the "cold season, these wells are described as warm, so it is evident that "they retain an equality of temperature during the year." This exactly coincides with my theory.

The following fact in Natural History may be interesting, as showing the effect of climate. In the early part of June last, a domestic fowl gave her eggs in a corner of my tent. I gave directions to my servants that the fowl should not in any way be disturbed. After she had given ten eggs, she commenced incubation. At the end of eleven or twelve days, I was surprised to observe a chick show its head from under the hen's wing, and on examining, I found a broken and empty shell. Next day the same thing occurred—a second chick appeared. The same was repeated on the third, fourth, fifth, sixth, and seventh, when the hen left the remaining three eggs, and would not sit any longer. I broke the three remaining eggs, and found dead birds in two, and one addled.

In another instance, a fowl gave two eggs in my tent, and afterwards—being perhaps displeased with the locality of the place—left them. After

some days I broke the eggs, and found chicks formed in each. We are aware that it has long been the custom to hatch chickens in Egypt in ovens. From this it would appear that the development of the chick in ovo commenced from the hour it was laid; but whether the chick would have been perfected by atmospheric heat alone, remains to be seen. I think it would, with a little care.

Table showing the amount of Sickness and Casualties in the Peshawur Force, for August, 1849.

		Regiments or Detachments.	Strength.	Number of Sick.	Casualties.
Bengal.	Europeans.	2nd Troop, 2nd Brigade, Horse Artillery	111	11	0
		3rd Company, 1st Battalion	69	1	2
		Detachment, Foot Artillery	211	13	1
		H. M.'s 61st Regiment of Foot	830	53	7
	Natives.	Details, Horse Artillery	120	6	0
		Details, Foot Artillery	155	10	0
		1st Regiment Light Cavalry	502	22	0
		31st Regiment of Infantry	896	18	1
		70th Regiment of Infantry	605	26	0
		13th Irregular Cavalry	530	38	1
		Sappers and Miners	90	6	0
Bombay.	Europeans.	3rd Troop, Horse Artillery	131	12	3
		2nd Company, 1st Battalion	100	7	1
		H. M.'s 60th Royal Rifles	852	96	8
		1st Bombay Fusiliers	813	74	4
	Natives.	Sappers and Miners, Native	129	6	0
		2nd Regiment, Scinde Horse	514	37	0
		3rd Regiment of Infantry	899	21	1
		19th Regiment of Infantry	937	19	1
		Scinde Baggage Corps	660	22	0
		Total	9154	498	30

Total casualties amongst the Europeans ... 26
Ditto ditto ditto Natives ... 4
} 30

The most prevalent diseases during the month have been fevers, ophthalmia, and bowel complaints.

State of the Thermometer under single Canvas at Peshawur, for the Month of April, 1849. CAMP PESHAWUR, 1*st May,* 1849.

April 1849.	THERMOMETER AND WIND.								REMARKS.
	Sunrise.	Noon.	4 P. M.	Midnight	Max.	Min.	Average	Wind.	
1	54	84	89	59	89	54	71½	S. W.	Clear. Heavy dew at night.
2	54	89	94	57	94	54	73⅓	S. W.	Clear. Heavy dew at night.
3	58	98	86	68	98	58	77½	W.	Cloudy throughout the day and night.
4	65	89	88	76	89	65	79½	S. W.	Cloudy. Heavy rain at 3 P.M., which continued for four hours, with thunder from S. W.
5	67	79	72	66	79	66	71	N. E.	Cloudy. Heavy rain with thunder and vivid lightning from N. E., which continued five hours.
6	58	85	70	56	85	56	67½	E. S. E.	Cloudy. Gentle rain at 3 P.M.
7	65	91	85	65	91	65	76½	E. S. E.	Cloudy throughout the day. Light breeze.
8	62	86	72	60	86	60	70	N. E.	Rain during the night. Heavy rain with thunder till eight o'clock A. M. Cloudy all day.
9	54	84	91	65	91	54	72½	N. E.	Cloudy, with dark heavy masses of electric clouds capping the Khybur hills.
10	58	90	85	66	90	58	74	E. S. E.	Cloudy. Threatening rain. Heavy masses of clouds in the west and south-west.
11	55	97	99	81	99	55	77	W. to S E	Cloudy. Wind veering about continually.
12	68	94	88	71	94	68	81	E. to W	Cloudy throughout the day.
13	68	70	69	67	70	68	69	E.	Cloudy, with frequent heavy showers. Hills to the westward capped with clouds.
14	63	85	77	61	85	63	74	W. to E.	A. M. clear. P. M. heavy electric clouds began to collect in dense masses over the hills to the westward (Khybur) in which the sun set red and troubled-looking. At or about midnight a violent storm of wind, rain, and thunder came on, which continued to rage with great fury till midnight. During the storm the lightning struck a tent, killed two and severely injured nine camp-followers.

April 1849.	Thermometer and Wind.								Remarks.
	Sunrise.	Noon.	4 P. M.	Midnight.	Max.	Min.	Average.	Wind.	
15	63	64	61	60	64	60	62½	E.	Heavy rain with thunder. The torrents came down from the hills in force, and did some damage in camp.
16	58	80	85	6[illegible]	85	58	71½	W. to N W	Cloudy through the day. Wind light, and variable
17	56	88	80	62	8[illegible]	5[illegible]	68	W. to E.	Cloudy. Winds variable and light.
18	60	95	85	69	9[illegible]	60	77½	W.	Cloudy. Wind light.
19	65	80	85	62	8[illegible]	62	73½	E. to W.	Clear. Winds variable & light. Dew at night.
20	60	93	99	89	99	60	79½	W. to E.	Clear. Winds light and variable.
21	61	97	96	70	9[illegible]	61	79	W.	Clear. Wind light. Dew at night.
22	61	81	80	69	81	61	71	W.	Cloudy. Light rain, with thunder from the East.
23	64	98	88	68	9[illegible]	64	81	E.	Clear. Wind light. Dew at night.
24	58	91	90	78	91	58	74½	W.	Cloudy. Wind light.
25	64	91	95	72	9[illegible]	64	79½	W. to E	Clear. Wind variable. Heavy dew at night.
26	70	87	92	70	9[illegible]	70	81	W. to E.	Clear. Winds light and variable. Heavy dew at night.
27	60	100	91	69	100	60	80	W. to E	Clear. Winds light & variable. Heavy dew at night.
28	64	97	100	70	100	64	82	W. to E.	Clear. Winds light & variable. Heavy dew.
29	64	100	93	80	100	64	82	N.E. to S.E.	Cloudy. Winds variable and light. Dew.
30	72	71	60	58	72	60	66	W.	Heavy rain all night and day from the westward. Khybur Hills covered with dense masses of clouds.

State of the Thermometer under single Canvas at Peshawur, from the 1*st till the* 15*th May; and in a House in the City open to the breeze, but not artificially cooled, from the* 16*th to the* 31*st May,* 1849, *inclusive.* PESHAWUR, 1*st June,* 1849.

May 1849.	Thermometer and Wind.									Remarks.
	Sunrise.	Noon.	4 P. M.	Midnight.	Max.	Min.	Average.	Wind. A.M.	Wind. P.M.	
1	63	79	66	60	79	60	68½	E.	E.	Heavy rain with thunder; hail-shower.
2	65	73	66	59	73	65	69	W.	E.	Heavy rain during the day and night. Cloudy.
3	61	87	91	63	91	61	76	E.	E.	Cloudy with slight shower. Heavy dust-storm at night.
4	63	75	85	64	85	63	74	Variable.		Cloudy with rain A. M. Evening clear. Dew.
5	61	96	91	70	96	61	78½	E.	W.	Clear. Dew at night.
6	64	102	109	95	109	64	86½	E.	W.	Clear. Dew at night.
7	90	100	104	80	104	80	92	W.	W.	Clear. Dew.
8	67	108	99	75	108	67	87½	W.	W.	Clear. Dew.
9	70	107	101	80	107	70	88½	W.	E.	A. M. clear. P. M. strong wind with rain.
10	70	104	100	70	104	70	87	W.	W.	Clear.
11	65	102	95	86	102	65	83½	W.	W.	Clear.
12	70	106	106	76	106	70	88	E.	E.	Clear. Dew at night.
13	70	107	104	79	107	70	88½	S.	S.	Cloudy.
14	71	100	101	70	101	70	86½	W.	W.	Strong breeze, and cloudy.
15	90	106	98	66	106	66	86	W.	W.	Strong wind with dust-storm, which continued from eight o'clock P.M. till midnight.
16	70	104	105	81	105	70	87½	W.	W.	
17	70	98	104	70	104	70	87	W.	W.	Strong wind. Dew.
18	73	90	100	71	100	71	85½	W	W.	Clear. Dew.
19	81	97	103	73	103	73	88	W	W.	Clear. Heavy dew.
20	80	102	105	75	105	75	90	W.	W.	Clear. Dew.
21	83	99	105	74	105	74	89½	W.	W.	Clear.
22	91	102	105	75	105	75	87½	W.	S.W	Clear.
23	85	100	104	73	104	73	88½	W.	W.	Strong hot wind, with dust-storm all night.
24	88	96	106	74	106	74	90	W.	W.	Clear.
25	82	99	10[illegible]	78	105	78	86½	S.W	S.W	Clear.
26	85	99	104	75	104	75	89½	W.	S.W	Wind and dust-storm.
27	84	99	104	75	104	75	89½	wsw	W	Clear.
28	84	97	103	91	103	84	93½	S.W	S.W	Clear.
29	85	99	104	89	104	85	94½	W.	W	Clear.
30	84	99	105	92	105	84	94½	W.	S.W	Clear.
31	88	102	106	91	106	88	97	W.	W.	A most severe dust-storm, which overset many tents, and continued till the evening of the 1st June.

State of the Thermometer in the Shade at Peshawur, for the Month of June, 1849. CAMP PESHAWUR, 1*st July*, 1849.

June 1849.	Thermometer and Wind.									Remarks.
	Sunrise.	Noon.	4 P. M.	Midnight.	Max.	Min.	Average.	Wind. A.M.	Wind. P.M.	
1	87	100	106	91	106	87	96½	W.	S.W	Clear. Hot wind with dust.
2	89	100	104	92	104	89	96½	W.	W.	Clear. Cool night.
3	95	103	108	93	108	93	100½	S.W	W.	Clear. Strong wind with dust.
4	95	103	106	92	106	92	99	W.	W.	Clear. Hot wind.
5	91	103	106	86	106	86	96	W.	S.W	Clear. Hot wind.
6	86	99	101	92	101	86	93½	W.	W.	Clear. Cool. Cloudy.
7	94	93	106	90	106	90	98	W.	S. E.	Afternoon cloudy, with thunder and heavy rain on the Khybur hills. Night also cloudy, with thunder, vivid lightning, dust-storm, after which the air became cool and refreshing.
8	93	100	103	88	103	88	95½	W.	S.W	Blowing a strong hot wind all day, with clouds of dust. Heavy electric clouds with thunder and rain. Hot wind with dust : continued all night.
9	89	100	103	86	103	86	94½	S.	S. E	Winds light and veering about. Heavy electric clouds in the Eastern horizon. Night cool. Dew.
10	85	96	100	87	100	85	92	W.	N.E	Wind veering about during the day. Night cool. Dew.
11	89	102	100	85	102	85	93	W.	wtos	Gusts of hot wind with dust. Night cool. [cool. Dew.
12	81	100	101	83	101	81	91	S.W	s·ose	Wind veering about. Night
13	83	103	103	80	103	80	91½	W	S.W	Clear. Night cool.
14	83	104	103	79	104	79	91	W.	S W	Strong breeze P. M. Cloudy. Night cool.
15	83	104	106	81	106	83	96	W.	S.W	Cool. Cloudy. Night cool.
16	85	106	109	84	109	84	96½	W.	S W	Hot wind. Hazy. Night cool.
17	86	104	101	84	104	84	94	W.	S.	Hot wind. Hazy. Night cool.
18	86	104	106	86	106	86	96	W.	S.W	Hot wind. Hazy. Night cool.
19	88	103	105	83	105	83	94	S.W	S.	Hazy. Night cool. Morning cool.
20	89	103	104	86	104	86	95	S.W	S. E.	Hazy. Whirlwind with dust. Lightning. Wind veering about W. to E. by the South. Night cool.
21	90	103	100	85	103	85	94	S.W	W.	Dust-storm, with vivid lightning and thunder. Night cool.
22	87	103	101	82	103	82	92½	S.	S.W	Clear. Cool night.
23	85	102	100	80	102	80	91	E.	S. E.	Cool night. Cloudy in the S. E. quarter.

June 1849.	Thermometer and Wind.									REMARKS.
	Sunrise.	Noon.	4 P. M.	Midnight	Max.	Min.	Average	Wind. A. M.	Wind. P. M.	
24	83	97	95	80	97	80	88½	W.	W.	Strong wind. Dust-storm. Cloudy. Thunder in the hills.
25	82	92	95	82	95	82	88½	S.E	E.	Cloudy. Thunder in the N. East. Cool.
26	85	95	96	83	96	83	89½	E.	swto S. E.	Cloudy. Thunder and rain in the hills to the Eastward.
27	88	95	94	85	95	85	90	E.	S. E.	Cool. Thunder and heavy rain in the hills to the North-west. Wind veering all round the compass, and in the evening thunder and rain in the hills to the southward. Night delightfully cool.
28	89	93	95	88	95	88	92½	E.	S.W	Wind unsteady, and veering about round the Compass. Strong gusts of wind with dust. Thunder and rain in the hills to the South-west and North-west. Night very cool and pleasant.
29	84	92	95	87	95	84	89½	E.	S.E.	Wind unsteady. Horizon to the southward and north-west shows heavy masses of clouds, with thunder and vivid lightning striking into the summit of the hills. Fitful gusts of wind, with partial clouds of dust. Night cold.
30	83	90	94	78	94	78	86	S.	S.	Cloudy, with heavy masses of clouds capping the Khybur hills. At 5½ P. M. a dust-storm came on from the E., when the Thermometer immediately sunk from 94° to 78°. The night very cold, with heavy dew.

State of the Thermometer in the Shade at Peshawur, for the M
of July, 1849. *Elevation above the level of the Sea*, 1068 *fe*
Lat 33° 59′ N., Long. 71° 40′ E. PESHAWUR, 1*st August*, 18

July 1849.	Thermometer and Wind.									REMARKS.
	Sunrise.	Noon.	4 P. M.	Midnight	Max.	Min.	Average.	Wind. A. M.	Wind. P. M.	
1	80	85	82	80	85	80	82½	W.	S.W	Cloudy. Night cool.
2	82	95	83	85	95	82	88½	S.W	W.	Morning cloudy. Evening cl Night cool.
3	86	96	85	84	96	84	90	W to	S. E.	Clear throughout the Night cool.
4	83	95	84	82	95	82	88½	W.	W.	Clear. Evening cloudy. Nig cool.
5	86	95	101	85	101	85	93	W.	S.W	Cloudy in the morning. Eve ing clear. Night cool.
6	91	95	103	87	103	87	95	W.	S.	Clear. Hot wind with dus storm. Night cool.
7	91	97	108	86	108	86	97	W.	S.W	Hazy throughout the twenty four hours. Night close.
8	90	92	100	84	100	84	92	N.	W.	Cloudy, with sudden gusts o wind. Night cool.
9	89	90	95	79	95	79	87	NW	NW	High wind, thunder and rain, all night : cool.
10	81	89	94	75	94	75	84½	S.W	E.	Cloudy. Thunder and rain till noon Cool night.
11	78	92	97	80	97	78	82½	W. to E. by the S.		Wind variable, veering from W. to E. by the South. Clondy. Very cool, like an English spring.
12	82	84	97	81	97	81	89	W to	S.W	Cloudy. High wind in the evening. Night cold and cloudless. Several meteors shooting about the horizon.
13	82	95	97	92	97	82	89½	S W	S. E	Clear. Cool.
14	86	99	106	90	106	86	96	W.	S.	A. M. clear. P. M. cloudy. Lightning in the N. E.
15	82	97	100	80	100	80	90	S.	S.W	Cloudy Cool night.
16	89	93	97	76	97	76	86½	W.	S W	A. M. cloudy with rain.
17	79	86	94	71	94	71	82½	S.	S. E.	Thunder with rain. Heavy rain in the hills, indicated by the increased volume of water brought down by the Bara, and other streams.
18	81	95	97	80	97	80	88	S.	S. E	Gentle showers of rain. Heavy rain on the hills. Night cool. Cloudy throughout the day. Night cool.
19	82	89	95	80	95	80	82½	SSW to NW		Cloudy throughout the day. Night cool.

July 1849.	Thermometer and Wind.									Remarks.
	Sunrise.	Noon.	4 P. M.	Midnight	Max.	Min.	Average.	Wind. A.M.	Wind. P.M.	
20	83	96	101	79	101	79	90	W.	NW	Cloudy. Cool. Night clear and cool.
21	85	9[illegible]	104	98	104	85	94½	W.	W.	Clear. Night cool.
22	87	97	100	90	100	87	93½	W.	W.	Cloudy. Close. Dust-storm. Night very close and oppressive.
23	88	107	95	80	107	80	93½	S.W	S.	Cloudy P. M. Thunder and dust-storm from the southward. At 6 P. M. the wind veered suddenly round to the eastward, and blew with great violence, accompanied by clouds of dust. Night clear and cool.
24	87	103	100	94	103	87	97½	W.	E.	Cloudy with thick haze, fire mist. Night close and suffocating, not a breath of wind.
25	90	109	101	86	109	86	97½	W.	E.	Hazy. Close and oppressive. Dust-storm from the North-west at 5½ P. M. Night hot and oppressive; not a breath of wind stirring, not a leaf on the trees moving. The birds now sought the deepest shade.
26	90	97	99	80	99	80	89½	E.	S.	Morning cloudy. Hazy. Breeze cool. P. M. strong wind with dust. Cloudy. Cool.
27	89	103	97	82	103	82	93	W.	N.	Cloudy, hazy, and close. Night hot.
28	90	97	102	86	102	86	94	W.	NW	[close. Cloudy. Close night. Hot and
29	91	99	104	90	104	90	97	W.	N.	Clear. Hot wind, with dust. Night close.
30	91	96	100	87	100	87	93½	N.	N.E	Cloudy. Threatening rain. Dust-storm A. M. Night cool.
31	86	94	100	91	99	86	92½	N.	NW	Cloudy. Cool. P. M. cloudy. Night cool.

State of the Thermometer in the Shade at Peshawur, for the Month of August, 1849. *Elevation above the level of the Sea,* 1068 *feet*— Lat. 33° 59′ N., Long. 71° 40′ E. PESHAWUR, 1*st Sept.*, 1849.

August 1849.	Thermometer and Wind.									Remarks.
	Sunrise.	Noon.	4 P. M.	Midnight	Max.	Min.	Average.	Wind. A. M.	Wind. P. M.	
1	88	95	100	90	100	88	94	W.	E.	Cloudy. Night cool.
2	88	97	100	92	100	88	94	W.	N.	Clear. Night cool. Heavy electric clouds over the hills.
3	90	98	104	94	104	90	99	S.	E.	Clear. P. M. hot wind. Night hot, close.
4	90	99	104	96	104	90	97	E.	W.	Clear. P. M. hot wind. Night close and sultry.
5	90	97	100	89	100	89	94½	W.	E.	Clear sky. Day hot and sultry.
6	86	98	103	90	103	86	94½	E.	E.	Cloudy. Dust-storm, which as usual cooled the air.
7	89	90	94	80	94	80	87	E.	N.	Cool and cloudy. Partial dust-storm from the east. During the night, there was a heavy fall of rain, with thunder and vivid lightning; after which the air felt cool and refreshing.
8	85	89	93	80	93	80	86½	E.	E.	Heavy masses of clouds hanging over the Khybur hills. Atmosphere cool and agreeable. Afternoon close and sultry. Heavy masses of dark lurid clouds hanging over the hills to the South-eastward, from which vivid lightning continued to dart during the whole night.
9	83	86	90	83	90	83	86½	NW	E.	A. M. cool and cloudy. Heavy masses of rain clouds rolling down the hills into the plain, with rain, thunder and lightning. The night damp and cool.
10	87	90	96	85	96	85	90½	N.	E.	Cloudy and cool. Thunder and lightning all round the horizon. Rain on the hills. Evening cloudy. Night cool.
11	89	95	99	100	100	89	94½	NW	W	Cloudy. Cool. Night close and sultry.
12	90	97	98	90	98	90	94	W.	W.	Cloudy. Cool. Night close.
13	91	100	104	99	104	91	97½	W.	W.	Hot. Night close and sultry.

August 1849.	Thermometer and Wind.									Remarks.
	Sunrise.	Noon.	4 P. M.	Midnight	Max.	Min.	Average.	Wind. A. M.	Wind. P. M.	
14	90	100	95	84	100	84	92	W.	W.	Hot day. Night close and sultry.
15	87	101	103	84	103	87	95	E.	S.E.	Heavy rain P. M., with thunder and lightning. During the rain, the thermometer fell 28° in two hours.
16	87	90	86	83	90	83	86½	NW	W.	Heavy rain till 9 A. M. Afternoon cloudy and cool.
17	81	92	97	85	97	81	89	W.	W.	Heavy clouds over the hills. Cool and damp. Night cool with rain.
18	79	94	97	80	97	79	89	S.	E.	A. M. cloudy. P. M. clear. Cool, air very damp.
19	82	89	94	79	94	79	86½	E.	W.	Cloudy and cool throughout the day.
20	84	91	86	76	91	76	83½	E.	E.	P. M. thunder with rain. Cool night.
21	80	96	94	80	96	80	88	E.	W.	Clear. Night cool.
22	82	90	91	78	91	78	84½	E.	E.	Cool. Clear.
23	83	92	91	78	92	78	85	S.	W.	Cloudy, with steady breeze.
24	83	90	96	89	96	83	89½	W.	W.	Cloudy. Thunder in the hills to the north-west. Cool.
25	86	92	95	90	95	86	90½	NW	W.	A. M. clear and cool. P. M. cloudy, with distant thunder.
26	87	94	96	83	96	83	89½	W.	W.	Clear throughout the day. Cool.
27	85	91	95	81	95	81	88	W.	E.	Cloudy P.M., with heavy clouds over the hills. Thunder and lightning. Slight rain. Strong wind.
28	86	95	98	80	98	80	89	E.	E.	Clear A. M. P. M. cloudy. Thunder, and slight rain.
29	89	90	94	78	94	78	86	S.W	S.W	Morning clear. Afternoon cloudy, with thunder and passing heavy showers, with strong squalls.
30	83	96	99	80	99	80	89½	E.	E.	Cloudy. Thunder and rain in the hills. Cool.
31	83	94	96	80	96	80	88	E.	E.	Morning clear. Mid-day and afternoon cloudy, with dust and high wind. Cool.

J. P. MALCOLMSON, *Surgeon,*

3rd Regt. Bo. N. I.

ART. VI.—*On the Saltness of the Red Sea.* By Dr. G. BUIST, F.R.S.L. & E., Secretary to the Society.

AT the Meeting of the Geographical Society held on the 18th October 1849, the following paper by the Secretary, on the Saltness of the Red Sea, was laid on the table. One of the investigations proposed by the Society in their scheme of general observation of 1845, was the determination of the Saltness of the Ocean, and of the gulfs and arms of the sea within the reach of our enquiries. He (Dr. B.) had then provided himself with a Salinometer, of peculiar delicacy, constructed on purpose by Mr. ADIE, and had made arrangements on the way out with the officers of the Peninsular and Oriental Steam Navigation Company's steamers to have observations made on temperature and gravity on the other side of Suez. Sir R. OLIVER and Captain LYNCH had gone cordially into these views, when the matter fell aside during the state of abeyance into which the scheme had from that time to within a few months of the present fallen. He had had not the less returns repeatedly sent him from vessels both on this and the other side of Suez, but hitherto they had not been put to any account. These experiments were not only of the highest interest, but they could at all times be very easily performed in seas traversed by steamers: the Engineers were always most ready to undertake any enquiry of this sort—it lay peculiarly to their hands,—and the same instruments employed, and experiments resorted to, in determining the strength of the brine in their boilers, would afford all that was required to determine the temperature and gravity of the ocean. Mr. MORRIS, Chief Engineer of the *Ajdaha*, had some time ago taken the more certain method of filling a succession of bottles full of water all the way from Suez to Bombay, and these having been placed in the hands of Dr. GIRAUD, whose assistance, valuable at all times, became doubly valuable from the promptitude, cheerfulness, and alacrity, with which it was rendered, had found the following to be the results: they were unexpected, but there was no reason to doubt as to their accuracy:—

		Latitude.	Longitude.	Sp. Gr.	Saline Contents in 1000 parts.
No. I.....	Sea at Suez.....	—	—	1027	41·0
No. II.....	Gulf of Suez.....	27° 49′	33° 44′	1026	40·0
No. III...	Red Sea.....	24° 29′	36°	1024	39·2
No. IV...	Ditto.....	20° 55′	38° 18′	1026	40·5
No. V.....	Ditto.....	20° 43′	40° 3′	1024	39·8
No. VI..... ...	Ditto.....	14° 34′	42° 43′	1024	39·9
No. VII.....	Ditto.....	12° 39′	44° 45′	1023	39·2

Dr. GIRAUD gives the following note of the Saltness of the Sea from a variety of other localities. From this it will be seen that the Mediterranean at Marseilles is of the same saltness as the Red Sea at Suez, while the Atlantic in the latitude of the Canaries is $\frac{1}{77}$ more salt :—

Baltic	...grs.	20·0 in 1000.
Frith of Forth	„	30.0 „
Boulogne	„	32·0 „
Havre	„	36·0 „
Bayonne	„	38·0 „
Marseilles	„	41·0 „
Atlantic (Canaries)	„	44·0 „

Following the sinuosities of the coast, the Red Sea shore is more than 4000 miles in extent from the Straits of Babelmandeb round. Not one drop of water flows in from any of the countries on its shores, and the nearest river to the Red Sea is the Nile, which approaches it at Suez to within eighty miles, but retires on the southward to four or five times this distance ; so that on the average there seems to be not less than 500 miles of the African side depending on the Red Sea for a supply of vapour. On the Arabian side the arid expanse is of similarly ample dimensions ; and in both cases, when a little rain does fall at the interval of years, it is nearly saturated with salt before it reaches the sea. The temperature of the air betwixt Suez and Aden often rises to 90°, and probably averages little less than 75° day and night all the year round. The surface of the sea varies in heat from 65° to 85°, and the difference betwixt the wet and dry bulb thermometers often amounts to 25°—in the Kamsin, or Desert winds, to from 30° to 40°: the average evaporation at Aden is about eight feet for the year, though the air on the Arabian promontory is from April to August nearly as damp as at Bombay during the open periods of the monsoon. Assuming the evaporation of the Red Sea to be no greater than that of Aden, a sheet of water eight feet thick, equal in area to the whole expanse of the sea, will be carried off annually in vapour ; or, assuming the Red Sea to be 800 feet in depth at an average,—and this most assuredly is more than double the fact,—the whole of it would be dried up were no water to enter from the ocean, in 100 years. The waters of the Red Sea throughout contain some four per cent of salt by weight—or, as salt is a half heavier than water, some 2·7 per cent in bulk,—or, in round numbers, say three per cent. In the course of 3000 years, on the assumptions just made, the Red Sea ought to have been one mass of solid salt.

The Mediterranean covers an area of about a million of square miles: —it draws its supplies from a river domain of about one million four

hundred thousand square miles,—this being about the sum of the areas of the basins of the rivers which supply it with fresh water. The Mediterranean receives no supplies worth naming on its southern shore from Alexandria westward, and as vapour diffuses itself by its own elasticity, without relation to the agency of the winds, it must impart moisture to an area five or six times the extent of that from which it receives its supplies, and probably expends three times as much water as it receives from all its rivers.* The balance is received through the Straits of Gibraltar, where there is a perpetual current flowing inward. As nothing but salt water enters through the Straits, and nothing but fresh water is carried off in vapour, the Mediterranean is supposed to be in process of salting up, though we have as yet no sufficient proof of the fact. But if the Mediterranean, which commands a vast supply of river water for nearly two-thirds of its circuit, be every year becoming more and more salt, much more ought this to be the case with the Red Sea; and nothing would be more desirable than to determine how far the fact concurs with, how far it disagrees from, theory. The facts to be dealt with are few, simple, and perfectly indisputable. 1st, The Red Sea receives no supply of water from any quarter save through the Straits of Babelmandeb,—there not being a single river or rivulet flowing into it from a circuit of four thousand miles of shore, the countries around being all singularly sterile and arid. 2nd, Judging from the ascertained evaporation in the sea itself, and from that at Suez and Aden, nearly eight feet of pure water must be carried off from the whole of the area of its surface annually—this being probably equivalent to $\frac{1}{100}$ part of its whole volume. From this the inferences, as already given, are inevitable—the Red Sea ought to have one per cent added annually to its saline contents: and as these constitute four per cent by weight, or two and a half per cent in volume, of its entire mass, it ought, under the operation of these laws, to have been converted into one solid salt formation in less than 3000 years; and yet we have no reason to believe that since the flight of the Israelites any material change has taken place in its character. It does not exceed the open ocean in saltness by more than one-tenth per cent; and the Gulf of Suez, which, from its general shallowness, the sandbanks with which its upper part abounds, its small area, and the manner in which it is surrounded by the burning desert, might be supposed particularly

* *Encyclopædia Britannica*—article Physical Geography.

favorable for concentration, is only one-tenth per cent more salt than the open sea betwixt Bombay and Aden.

All seas and bodies of water have a tendency to get salted and silted up in time: all the water which enters them bears along with it a certain amount of saline, as well as of earthy, particles, while the vapour carried away is necessarily pure. Inland seas are more subject to this than the open ocean. The Caspian and Dead Seas, the Lake of Tiberias, and other seas of no exit in Western Asia, seem to have attained a state of equilibrium as to quantity of water, the river supplies being just sufficient to compensate for the loss occasioned by evaporation, so that for about two thousand years, the period through which they have been known to us, no material change in their area or level seemed to have occurred. The great salt lake described by Captain HARRIS as probably a fragment severed by an earthquake from the Gulf of Tadjurra, is rapidly filling up with salt : its waters are being dried up by the heat of the sun, and no stream or current supplies their place ; and in a few years more it will in all likelihood be one mass of salt, like the vast repositories in Scinde, probably produced by like causes.

To determine the state of the water in the depths of the Red Sea, becomes then a matter of special interest—though this is a task less fitted for steamers than for sailing vessels. In India, rude makeshifts often require to be resorted to to obtain the ends which would in Europe be sought for by the contrivances of science and resources of mechanics. He (the Secretary) had some seven months since got up a contrivance, which, though coarse and clumsy, suited well enough for bringing up water from great depths without change of condition or material alteration of temperature. It consisted of a piece of iron pipe, four feet long and six inches in diameter : there was no reason for adhering to these dimensions, but he chanced to have such a pipe beside him at the time. It was plugged up with a large piece of wood at both ends—carefully pitched outside

and in. A strong hook was screwed into the plug at the end meant to be uppermost when the pipe was lowered—to this a rope was attached. In the centre of the plug at the other end, a hole two inches in diameter at the outer end or mouth, 1½ at the inner end, was bored : on each side of this was a strong hook : the hole betwixt this was closed with a conical plug, to the outer end of which a line was attached. This, when desired to be used, was lowered over the ship's side with the plugged end undermost, the plug being driven home tight. The rope attached to the end meant to descend first was run out slack till the whole reached the depth from which water was desired to be brought up. The rope, hitherto slack, was now made fast—that by which the pipe had been lowered was slackened. By a sudden jerk the plug was released from its place, and the water allowed to find its way into the pipe, which had hitherto been shut up, filled with air. In this position the whole apparatus should remain for half an hour at least, that it might acquire the temperature of the water around. The plug line being now slackened, the plug itself would drop ito its place, and the apparatus being pulled up sharply would bring some gallons of water along with it, which would retain its temperature unaltered for five or ten minutes : when on deck the plug might be removed, and the temperature determined by the insertion of a thermometer. This was the only process in reference to which time was of consequence. The specific gravity might next be taken by hydrometer. The animal and earthy contents of the water should next be carefully examined—then its specific gravity : a bottle two of it should be set aside for future examination, while a portion of it ought to be immediately tested by evaporation. The safest mode of performing this operation on board ship would probably be the following :—Have a narrow-necked bottle, graduated at the top to say 14000 grains, of two pounds of water, lines being drawn for temperature of 65, 70, 75, and 80, as this will probably exhaust the entire range of temperature

at considerable depths. Let a bottle of this be poured into a well-cleaned cooking pot of moderate size, the weight of which has been previously determined. The water should now be evaporated to dryness, and the cooking pot with the salt weighed again, and the increase of weight will of course be the weight of the salt. The salt should now be carefully removed from the cooking pot, and after being a second time weighed, shut up in a phial for future examination as to its ingredients. The whole of these operations are so very simple that they may in great measure be performed on shipboard with veryli ttle trouble or inconvenience : the water and salt preserved affording the means of future check. It is, however, of great importance to come to a definite conclusion on all such matters as speedily as possible—experimenting away in the dark, without any immediate results, was one of the most tiresome and uninteresting things imaginable. The apparatus already described might be modified in form in many different ways—in the form here mentioned it was simple and easily made use of, and where iron pipe of any dimensions could be had, it would not cost more than Rs. 7 or Rs. 8 when completed. The only instrument of the kind as yet tried was that used by Lieutenant FULLERTON in the Persian Gulf. After having been completed it was taken on board the *Hastings*, and there tested by Commander JENKINS and Mr WATERSTON, who found it to work most satisfactorily. He had no doubt that at the Steam Factory much better instruments than the one referred to, on the same general plan, might be fitted up for the use of all our surveying vessels.

The following paper, in continuation, was read before the Society on the 22nd November.

Shortly after laying the preceding remarks before the Society, I met in with the following notice in the *London Athenæum* of the 18th August :—

" Some curious investigations have been for some time carried on in the Gut of Gibraltar by M. Coupvent-des-Bois. He has proved as a certainty the existence of a superficial current flowing from the ocean into the Mediterranean, and of a deep under-current flowing from the Mediterranean into the ocean. He has also ascertained that between these two currents there exists a bed of water which is in perfect repose."

Assuming what is here stated to be a matter perfectly ascertained, the suggestions to which it gives rise become very important. Before adverting to these I may as well give the following quotation from LYELL, as bearing in the most important manner on the subject under discussion :—

"*Straits of Gibraltar.*—It is well known that a powerful current sets constantly from the Atlantic into the Mediterranean, and its influence extends along the whole southern borders of that sea, and even to the shores of Asia Minor. Captain Smyth found, during his survey, that the central current ran constantly at the rate of from three to six miles an hour eastward into the Mediterranean, the body of water being three miles and a half wide. But there are also two lateral currents—one on the European, and one on the African side each of them, about two miles and a half broad, and flowing at about the same rate as the central stream. These lateral currents ebb and flow with the tide, setting alternately into the Mediterranean and into the Atlantic. The escape of the great body of water, which is constantly flowing in, has usually been accounted for by evaporation, which must be very rapid and copious in the Mediterranean; for the winds blowing from the shores of Africa are hot and dry, and hygrometrical experiments recently made in Malta and other places show that the mean quantity of moisture in the air investing the Mediterranean is equal only to one half of that in the atmosphere of England. It is, however, objected that evaporation carries away only fresh-water, and that the current is continually bringing in salt-water: why, then, do not the component parts of the waters of the Mediterranean vary? or, why do they remain apparently the same as those of the ocean? Some have imagined that the excess of salt might be carried away by an under-current running in a contrary direction to the superior,—and this hypothesis appeared to receive confirmation from a late discovery that the water taken up about fifty miles within the Straits, from a depth of six hundred and seventy fathoms, contained a quantity of salt *four times greater* than the water of the surface. Dr. Wollaston,* who analysed this water obtained by Captain Smyth, truly inferred that an under-current of such denser water, flowing outward, if of equal breadth and depth with the current near the surface, would carry out as much salt below as it brought in above, although it moved with less than one-fourth part of the velocity, and would thus prevent a perpetual increase of saltness in the Mediterranean beyond that existing in the Atlantic. It was also remarked by others, that the result would be the same, if, the swiftness being equal, the inferior current had only a fourth of the volume of the superior. At the same time there appeared reason to conclude that this great specific gravity was only acquired by water at immense depths; for two specimens of the water taken at the distance of some hundred miles from the Straits, and at depths of four hundred, and even four hundred and fifty, fathoms, were found by Dr.

* "On the Water of the Mediterranean, by W. H. Wollaston, M.D., F.R.S., Phil. Trans. 1829, part I., p. 29."

Wollaston not to exceed in density that of many ordinary samples of sea-water. Such being the case, we can now prove that the vast amount of salt brought into the Mediterranean *does not* pass out again by the Straits. For it appears by Captain Smyth's soundings, which Dr. Wollaston had not seen, that between the Capes of Trafalgar and Spartel, which are twenty-two miles apart, and where the Straits are shallowest, the deepest part, which is on the side of Cape Spartel, is only *two hundred and twenty fathoms*. It is therefore evident, that if water sinks in certain parts of the Mediterranean, in consequence of the increase of its specific gravity, to greater depths than two hundred and twenty fathoms, it can never flow out again into the Atlantic, since it must be stopped by the sub-marine barrier which crosses the shallowest part of the Straits of Gibraltar.

"What, then, becomes of the excess of salt?—for this is an inquiry of the highest geological interest. The Rhone, the Po, and many hundred minor streams and springs, pour annually into the Mediterranean large quantities of carbonate of lime, together with iron, magnesia, silica, alumina, sulphur, and other mineral ingredients, in a state of chemical solution. To explain why the influx of this matter does not alter the composition of this sea, has never been thought to present a great difficulty; for it is known that calcareous rocks are forming in the delta of the Rhone, in the Adriatic, on the coast of Asia Minor, and in other localities. Precipitation is acknowledged to be the means whereby the surplus mineral matter is disposed of, after the consumption of a certain portion in the secretions of testacea and zoophytes. But some have imagined that, before muriate of soda can, in like manner, be precipitated, the whole Mediterranean ought to become as much saturated with salt as the brine springs of Cheshire, or Lake Aral, or the Dead Sea. There is, however, an essential difference between these cases; for the Mediterranean is not only incomparably greater than the two last-mentioned basins, but its depth is enormous. In the narrowest part of the Straits of Gibraltar, where they are about nine miles broad, between the Isle of Tariffa and Alcanzar Point, the depth varies from one hundred and sixty to five hundred fathoms; but between Gibraltar and Ceuta, Captain Smyth sounded to the extraordinary depth of *nine hundred and fifty fathoms!* where he found a gravelly bottom with fragments of broken shells. Saussure sounded to the depth of two thousand feet within a few yards of the shore, at Nice. What profundity, then, may we not expect some of the central abysses of this sea to reach! The evaporation being, as we before stated, very rapid, the surface water becomes impregnated with a slight excess of salt; and its specific gravity being thus increased, it instantly falls to the bottom, while lighter water rises to the top, or that introduced by rivers, and by the current from the Atlantic, flows over it. But the heavier fluid does not merely fall to the bottom, but flows on till it reaches the lowest part of one of those submarine basins into which we must suppose the bottom of this inland sea to be divided. By the continuance of this process, additional supplies of brine are annually carried to deep repositories, until the lower strata of water are fully saturated, and precipitation takes place—not

in thin films, such as are said to cover the alluvial marshes along the western shores of the Euxine, nor in minute layers, like those of the salt 'étangs' of the Rhone, but on the grandest scale—continuous masses of pure rock-salt, extending perhaps, for hundreds of miles in length, like those in the mountains of Poland, Hungary, Transylvania, and Spain.*

"The Straits of Gibraltar are said to become gradually wider by the wearing down of the cliffs on each side at many points; and the current sets along the coast of Africa so as to cause considerable inroads in various parts, particularly near Carthage, Near the Canopic mouth of the Nile, at Aboukir, the coast was greatly devastated in the year 1784, when a small island was nearly consumed. By a series of similar operations, the old site of the cities of Nicopolis, Taposiris, Parva, and Canopus, have become a sandbank."†—*Lyell's Geology*, vol. I., pp. 296-299.

With the greatest deference to so very high an authority on such subjects as Sir CHARLES LYELL, it does not, so far as I can perceive, seem at all necessary that the sea water, on becoming concentrated at the surface, by reason of evaporation, and descending by increase of specific gravity, should continue to increase in saltness or weight, or approach the point of saturation as it descends. According to Dr. WATSON'S Tables, Sea water, containing $\frac{1}{36}$ of salt, at a temperature of 62°, has a specific gravity of 1·029: with $\frac{1}{12}$ of salt the gravity amounts to 1·059. Now supposing water at the surface, of the former strength, it would, on acquiring the latter, or any other sufficient to cause it to descend, sink into the recesses of the sea, and

* "As to the existence of an inferior current flowing westward, none of the experiments made in the late survey give any countenance whatever to this popular notion; and it seems most unnecessary to resort to it, not only because the expenditure of the Mediterranean, by evaporation, must be immense, but because it is not yet proved that the two lateral currents, which conjointly exceed in breadth that of the centre, do not restore the equilibrium, if occasionally disturbed. They ebb and flow with the tide, but they may carry more water to the west than to the east. The opinion, that in the middle of the Straits the water returned into the Atlantic by a submarine counter-current, first originated in the following circumstance. M. Du l'Aigle, commander of a privateer called the *Phœnix* of Marseilles, gave chase to a Dutch merchant ship, near Ceuta Point, and came up with her in the middle of the gut, between Tariffa and Tangier, and there gave her one broadside, which directly sunk her. A few days after, the sunk ship, with her cargo of brandy and oil, arose on the shore near Tangier, which is at least four leagues to the westward of the place where she sunk, and directly against the strength of the *central* current.—Phil. Trans., 1724. It seems obvious that the ship in this case was brought back by one of the *lateral* currents, not by an *under* current."

† "Clarke's Travels in Europe, Asia, and Africa, vol. iii., pp. 340 and 363, 4th edition.

there accumulate in quantity till the surface of the heavier water rose to the height of the summit of the barrier which confined it, when it would flow over and mingle with the waters beyond. It by no means appears necessary that any concentration approaching the point of saturation should ever be attained. The fact mentioned by Sir C. LYELL, of water at the depth of four hundred and fifty fathoms not exceeding in gravity that found at the surface, connected with the fact of the Straits at the shallowest being not more than two hundred and fifty fathoms, is opposed to the views just set forth. But with the new fact of the outward current before us, and in defect of all evidence of the actual accumulation of salt, it may probably turn out that what was thirty years ago assumed as indisputable, is in reality at variance altogether with truth. Turning from the Mediterranean to the Red Sea, I observe that the late lamented Dr MALCOLMSON had directed his attention to the superior saltness of its waters so far back as 1836. The Engineers of the *Hugh Lindsay* had complained of the tendency of the boilers to salt up, and Dr. MALCOLMSON on his way home carefully examined the water, which at Mocha, and near Kamran, hardly differed from that of the open sea. At Cosseir it attained the specific gravity of 1·035, shewing a degree of saltness greater than that found by Dr. GIRAUD in the waters from Suez. A paper on the subject was laid before the Asiatic Society of London, in April 1837. The almost total discontinuance of surveying on this side of India was one of the sources of retrenchment contemplated by the Finance Committee of 1838, and it is to Sir C. MALCOLM and his illustrious brother that we owe it that the survey of the Red Sea was not put a stop to just at the time it was about to become the highway of communication betwixt India and Europe. Our Charts and Maps, under these circumstances, could not, admirable as they are, be expected to contain much more information than was requisite for the purposes of navigation, and it is to our cruizers we now look for enlightenment on the numberless momentous points of physical geography in reference to which we are at present in utter darkness. Giving up the question of the Mediterranean, we do not know that in the Channel of the Red Sea there are any of those tremendous recesses in which salt might accumulate in masses, or that the deepest part of the Channel might not be the Straits, through which, in this case, a natural under-current of brine might be expected to flow. The whole state of the depths of the sea is a mystery tous, and no more fertile field of enquiry presents

itself to the intelligent officer anxious to acquire and communicate information and to earn fame. In my last paper I laid before the Society a plan and model of a contrivance for bringing up water from great depths: this has to a limited extent been tried, and proved successful. In 1839, when on the eve of leaving home, I laid the subjoined plan of a contrivance for determining the strength and direction of currents at great depths, before the St. Andrew's Philosophical Society, which has not, so far as I know, been brought into use. The Admiralty's Manual affords no light on the subject. Assuming the hypothesis here proceeded on as the correct one, we shall have the phenomena presented by the Red Sea, and probably also those supplied by the Mediterranean, transferred from the category of developments in which the existing state of things is being gradually prepared for some grand catastrophe—where seas and lakes are being salted or silted up prior to approximate obliteration, after which the solid contents of their beds may be thrown up and take the place of the Continents and Mountain-lands now existing,— into the category of phenomena where events run in a perpetual circle, and where the revolution threatened to be worked by one set of processes is counterworked by another. If there be a constant under-current of brine pouring out through the Straits of Babelmandeb, to compensate for the prodigious loss by vapour which must occur over the whole expanse of the Red Sea, it will mingle with the waters of the ocean to the east of Aden or Socotra, and be swept along to the shores of India, to be duly diluted to the standard strength of sea water by the torrents pouring down from the interior during the months of June, July, and August. The superior saltness of the Atlantic near the Canaries may probably be occasioned by the brine flowing through the Straits of Gibraltar. Such are the beautiful harmonies we see everywhere pervading the system of the Universe—harmonies equally calculated to delight and astonish whether working for the maintenance, for an infinite period of time, of matters as they now exist, or transforming present existences so as to prepare them for one of those grand catastrophes to which the world we inhabit, seems destined to be periodically subjected.*

* For many of the views embodied in this paper, I am indebted to Mr ACTON S. AYRTON, who was at once struck with the idea of a submarine brine-current on seeing the difficulty the conjectures embodied in the first part of the paper gave rise to.

DESCRIPTION OF CURRENT INSTRUMENT.

THE diagrams 1 and 2 in plate I. and 3 and 4 in plate II. represent various views of the Current-measuring instrument. It consists of a hollow sphere of brass, K N, seven inches in diameter, — the two halves of which are united together by a flange and screws. The sphere is suspended in a copper stirrup HHCC, two feet long, with a gape of seven inches. A thin double-tailed vane of sheet copper is made fast to one side of the sphere, the plane of which is at right angles to the plane of the stirrup. The vane and lower half of the sphere can be separated from the stirrup and upper half by undoing (see fig. 4, plate II.,) the flange-bolts. Inside the sphere is a mariner's compass, the pivot on which the needle turns being capable of being withdrawn from under it so as to clamp the needle itself against the card by the levers O P U and O P U. Z is a stuffing box or gland, through which the upright terminating in the pivot passes. HH are eyes through which light lanyards are rove, a tug of which clamps the needle. AD, fig. 2 plate I., is a finely finished strong swivel that allows the whole to turn freely in the water. From this the direction portion of the instrument will be understood: the force portion has been found not to answer, and may be passed over with little notice. It consists of a vertical vane E, figs. 1 and 2 plate II, turning on pinching screws CC, and kept in its place at F by the rachet G. It is disengaged by the same tug of the lanyard that clamps the compass. A wooden stand, on which the whole may rest when not in use, secures the gearing and vane underneath. When about to be used, a strong half-inch rope is rove through the swivel-ring A—a light lanyard with a double end being attached to the clamping gear at H and H. The instrument should be lowered from the fore part of the ship, the lanyard being taken well aft to avoid the risk of entanglement. When the whole, which is about seventy pounds in weight, has reached the proper depth and been allowed to swing for a few minutes, the lanyard is pulled and the compass thus clamped. The whole is then pulled up, and either a soft piece of iron such as that represented in fig. 4 *d d* placed on the pivot, or a pocket-compass held over it,—*this* at once indicating the position of the needle inside the sphere: the angle formed with this by the vane shows the direction of the submarine current. From the extreme difficulty of keeping the water out from the interior of the sphere, I propose giving up the attempt to do so, and opening a small hole on the upper part of it to permit water to have free access. The needle hereafter employed will be a stout bar made to traverse on Dent's principle by an axle passed through. The steel will be protected by gilding, varnish, or a coat of copper. The instrument must be taken to pieces and dried every day as the work is over.

THE instrument in plate II. for obtaining specimens of water from great depths, takes the place of that represented in my paper on the subject, being much more simple and efficient. It consists of a cylinder of common tin plate with a double wall, the outer and inner plates of which are an inch or so apart and filled up with dammer, pitch, sealing-wax, or some other bad conductor. Inside is a solid piston of wood, with a slight groove on one side. A cross bar and side-links allow this to be pulled out to about three quarters of its length. The piston being forced home, the whole is lowered to the required depth in the water: the piston line being pulled, withdraws the piston, and of course the water at this particular depth finds its way through the groove and takes the place of the piston itself. The whole is now quickly withdrawn: the piston pulled out altogether, and the water examined. This I have tried at depths of thirty and forty feet, and found it to answer perfectly.

PLATE I.

Instrument for measuring the force and direction of Submarine Currents.—Fig. 1 side view; Fig. 2 front view. K. N. upper and lower halves of a brass hemisphere seven inches in diameter, bolted together by a flange and screws; E. force-plate; G. ratchet to keep E in its piace; S. direction vane; A. swivel-ring to which lowering rope is attached. H. side rods for clamping the Compass inside.

Fig. 2.

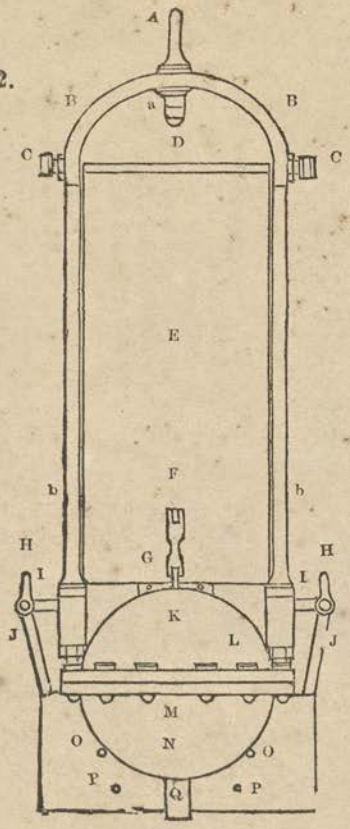


Fig. 1.

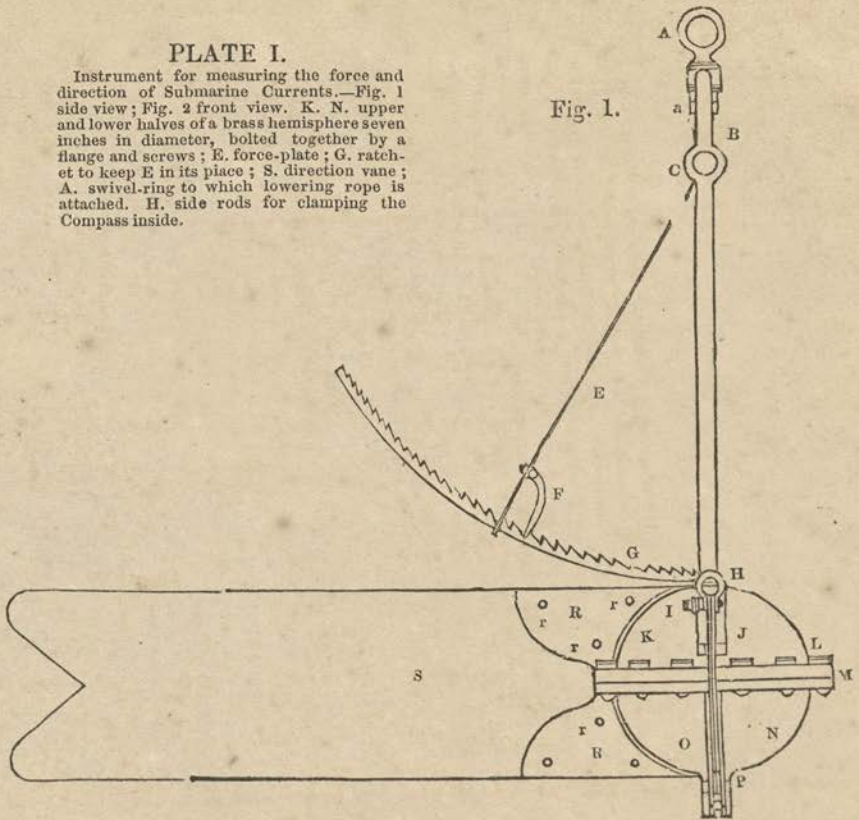
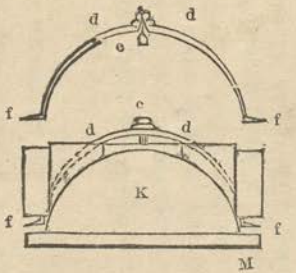


PLATE II.

Cylinder for drawing water from considerable depths under the surface of the water.

Fig. 5.



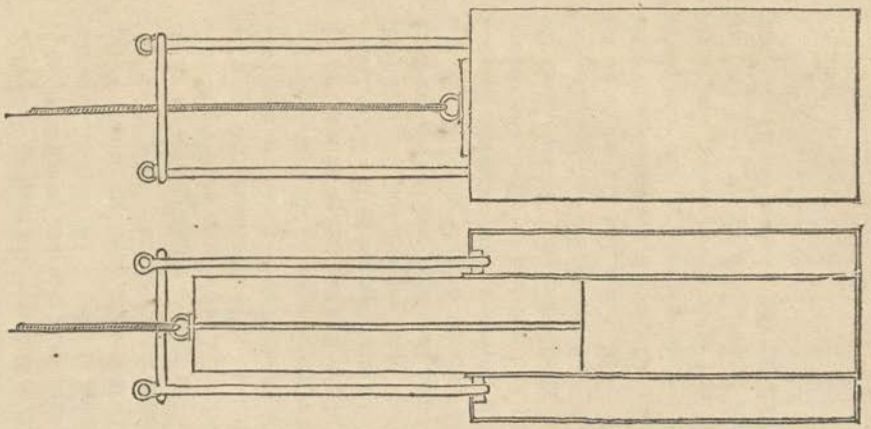


Fig. 4.

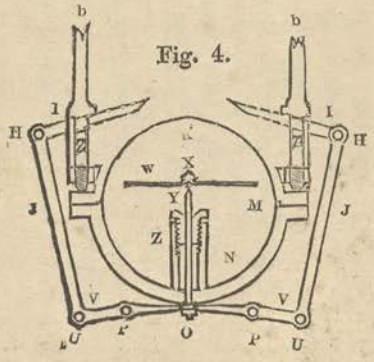
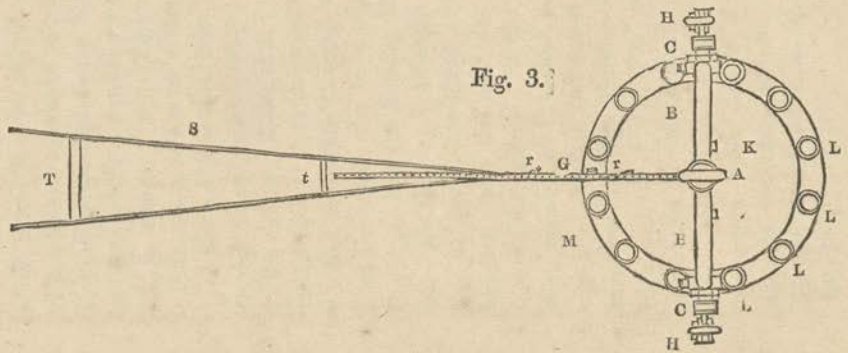


Fig. 3.



ART. VII.—*Diary of a March, with the 3rd Regiment Bombay N. I., from Roree to Mooltan and Peshawur.* By Lieutenant H. G. RAVERTY, 3rd Regiment Bombay N. I.

ON the evening of the 25th September, 1848, the Right Wing of the 3rd Regiment N. I. was ordered to march next day on Sukkur, to relieve the 9th Regt. N. I., which regiment, together with a detachment of the Scinde Irregular Horse, consisting of 500 men, were to march on Mooltan to reinforce the Army of Major-General Whish, C. B., then laying siege to that place. The Right Wing of the 3rd Regt. N. I. marched; and on the afternoon of the 26th, the Left Wing was ordered to join the Head Quarters; and the regiment, after crossing the Indus at Turrai Chanee, was ordered to proceed with the Scinde Horse, then at Subzulkote, to Mooltan, instead of the 9th Regt. N. I., which was ordered to remain at Sukkur. On reaching Ghotkee, the third march from Roree, the corps was ordered to return to the latter place, which it reached on the 5th October. On the 15th, it again left, in company with Turnbull's Battery, to join the Sindh Horse at Subzulkote, and remain there until further orders. After being delayed five weeks at this place, and ten days at Chungee-Khan-ke-Gote, the detachment reached Major-General Whish's camp, at Sooruj Koond, on the morning of the 11th December. The detachment left again on on the 16th of the same month for Shere-Shah-ke-Puttun, to escort the Bombay siege train to camp, and returned again on the 20th. On the 23rd December, the remainder of the Bombay troops joined, and on Christmas Day the Bombay Division was inspected by the Major-General. On this day the Bengal troops broke ground, and took up a position at Seetul-kee-Maree, the place they first occupied on reaching Mooltan; and the next day the Bombay division joined the Bengal force at that place. On the 27th December, two attacking columns were paraded at 11 o'clock A. M., and marched to attack the enemy, who fired the first shot exactly at 12 o'clock noon. By five o'clock the same evening, the Mundee Awah, and the Seedee-Lall-ke-Bede, two high mounds within 700 yards of the town, and the whole of the suburbs on the southern and western sides, were in our possession to within 250 yards of the Khonee Burj. Heavy guns and mortars were placed in position on the Mundee Awah and other places during that night and the next day, and the siege pressed with vigour until the 2nd January 1849 at 3 P. M., on which day the breach at the Khonee Burj

was stormed by the Bombay troops. About an hour after this had taken place, the Bengal storming column, having failed in their attack on the Delhi Gate, entered by the breach previously stormed by the Bombay troops; and by sunset the whole of the city was in our possession. On the evening of the 21st January, two breaches were declared practicable in the fort walls, and the troops to form the storming parties were told off for the next morning at daybreak; when Moolraj sent in to say that he would surrender the fortress, and his garrison lay down their arms the next morning at sunrise. This offer was accepted, but in case it should merely turn out to be a ruse, to gain time, on the part of the enemy, the troops were to storm the breaches at 7 o'clock A. M. During the night of the 21st and morning of the 22nd January, the rain fell in torrents, and the men fell in wet and shivering; and after a great deal of difficulty, from the muddy roads through the suburbs, which led to the Dowlut Gate, out of which Moolraj was to come, the troops reached their destination a little after daylight. The rain still continued to pour, when at about 7 o'clock A. M. Dewan Moolraj, Nazim of Mooltan, followed by his principal officers, and the remains of his garrison, amounting to above 3000 persons, came out and gave up their arms. Here terminated the operations before Mooltan.—On the 2nd February 1849, a portion of the Bombay division, under Colonel the Hon'ble H. Dundas, C.B., marched to join the Army under Lord Gough, the greater part of the Bengal division having preceded us by brigades some days before. On the evening of the 18th February, after a forced march of thirty-three miles, the Bombay portion reached Ramnuggur, and the next day, having crossed the Chenab, joined the Commander-in-Chief. Next morning the whole Army broke ground and took up a fresh position near the town of Goojrat, which was occupied by some of Shere Singh's force, and distant from our camp three miles. On the 21st, the Seikhs were completely overthrown at Goojrat, with the loss of their camp and 54 guns; and on the morning of the 22nd, the Bombay division, together with a portion of Bengal troops, the whole under Sir W. R. Gilbert, G. C. B., marched in pursuit of the flying foe. On the 5th March, having crossed the five rapid branches of the river Jhelum, the force reached Rhotas; and on the 12th March, near 6,000 Seikhs laid down their arms, and delivered up 41 guns, at Hoormuck, one march distant from Rawul Pindee. On the 14th, the whole force encamped at Rawul Pindee, when the remainder of the Seikh Army, to the number of 14,000 men,

laid down their arms; and Chuttur Singh, together with his sons Shere and Aotar Singh, and the chief Seikh Sirdars, gave themselves up to the Political Agent with the Army.

The Indus was crossed by the bridge of boats on the 20th, the Affghans in their flight having cut away the ropes of the bridge from the Khairabad side, which of course caused it to float towards the fort of Attok. We encamped at a village six miles from Peshawur on the 22nd March, and on the 28th of the same month encamped at Jumrood, about half way between the City and the Khybur Pass. On the 7th May, the force marched to the different places in and near the City allotted to them for the hot season, and where they still continue.

Roree.—An old town of Upper Sindh, opposite to Sukkur, and situated close to the left bank of the Indus. It is built on a heap of flinty rocks, which abound for many miles round, and to the opposite side of the river. Viewed from a distance, the houses, which are tall and desolate-looking, seem piled on each other: many of the better sort of houses have wooden balconies. The streets are steep and narrow, particularly at the entrance of the bazar, which is pretty good for such a town. One street of this bazar is covered in with palm leaves from street to street. The number of inhabitants is about 5,000: the town has but little or no trade. To the south of the town of Roree, the land is tolerably cultivated, and there are a few gardens. The heat here, as well as at Sukkur, is very great; more particularly so on account of the rocks on which it is built. The town, like the generality of native places, is dirty and unhealthy. The scenery about this, taking Sukkur, the old fortress of Bukkur and Roree, together with the windings of the Indus, is highly picturesque. Roree is, by tradition, the site of a city built by Alexander, who halted in the vicinity on his march down the Indus.

Turrai Chanee.—A small and mean village, distant from Roree seven miles. The road is very good, and the country well cultivated, chiefly consisting of jowaree fields. Supplies are not procurable.

Choongah—distant from Turrai Chanee nine miles—is a small village, situated near a branch of the Indus. Everything round here is of the most delightful green, which is quite a relief to the eye, after the dreary wastes to which we were accustomed in Sindh. The inhabitants seem very poor, and supplies are very difficult to obtain.

Hadjee Mullowdee.—A small and dirty village, containing about sixty huts, and similar to the village encamped at on the previous day. It is

distant from Choongah nine miles and three furlongs. The country round is well cultivated: the jowaree fields in particular were of great height, in numerous places reaching to eighteen and twenty feet.

Gotkee—distant from Hadjee Mullowdee ten miles—is a good sized town, containing 2,000 inhabitants, Hindoos and Mahomedans,—in about equal numbers. There is a large and well-built Musjeed here, which contains eighty-six pillars of wood. Gotkee is in the Collectorate of Sukkur, and extends about four miles further to the northward. The revenue of the country between Roree and this is said to amount to one lac of rupees. Supplies are plentiful, and tolerably cheap. Country well cultivated, and the road particularly good.

Baghodrah.—A small village, containing about four hundred inhabitants, and distant from Gotkee fifteen miles. Supplies are not procurable. The road as before good, and the grain-fields looked very fine.

Abbowrah.—This is a rather large and flourishing town, containing about 2,000 inhabitants, and is surrounded by a wall. It is situated in, and belongs to, His Highness Meer Ali Morad's territory. The people are Mahomedans and Hindoos; the latter are in greater numbers. The revenue is about 30,000 rupees.—Distant from Baghodrah thirteen miles. Supplies are plentiful and cheap.

Subzulkote.—A large town, surrounded by a mud wall thirty feet high, and contains 2,000 souls. It belongs to His Highness the Nawab of Bhawulpore, and is the first town in his territory that we passed in our route. The streets are, as usual, narrow and dirty, and the people to all appearance poor. The little trade that is carried on is chiefly in grain. Subzulkote is an arsenal of the Nawab's, where, at the time I visited it, there were six guns, six-pounders and smaller calibre, mounted on new carriages. Some of the guns bore the name of "John Thomas Sahib Bahadoor," in the Persian character. There is a regiment of the Nawab's stationed here, and a more dirty and ragged-looking set I have never seen, except Major Edwardes' so-called "Victorious Army." They were commanded by a Captain Poorun Singh, who was inclined to be saucy, and who I since hear has been dismissed by the Nawab for insolent conduct. The country around is green in many places, but badly cultivated in comparison to the places passed in our route here. The revenue is 25,000 rupees. Supplies are cheap and plentiful. It is distant from Abbowrah eleven miles and five furlongs.

Sunjūrpūr.—A small village distant from Subzulkote seven miles. It contains very few inhabitants, and has no bazar. There was one solitary shop, and that was an armourer's. Supplies not procurable. Country well cultivated, and road very good—in fact, wide enough for a company of infantry to march abreast.

Ahmedpūr—called the "Less," to distinguish it from the other place of the same name—is distant from Sunjūrpūr eight miles. It contains a small fort of no strength, and has no artillery. We were not allowed to enter, and the men at the gate seemed very suspicious of us. There is a good bazar, and supplies were plentiful. The town, which is surrounded by a mud wall broken down in many places, is well built and clean. It contains about 3,000 inhabitants. Some of the men with whom I entered into conversation, seemed very inquisitive about the number of our guns, and whether any more were on the road. I noticed a great many wounded men here, and found that they had been with the Nawab's army then before Mooltan. The country round is undulating, and covered with the greenest grass. In many places the cattle, which are very fine, were grazing in the fields, and the landscape, which is well wooded, reminded me much of home. The revenue is 30,000 rupees.

Toreewallah.—Is a large but thinly-populated village, distant from Ahmedpūr six miles. It contains about five hundred inhabitants, and is surrounded by a low mud wall; there is a large bazar, but nearly one half of the shops were closed. The village belongs to Summundur Khan, one of the Nawab's officers, and yields about 5,000 Rs. revenue. The country round is sandy, and little or no cultivation. Supplies not procurable. The village is situated on a high mound.

Nowshara.—A dirty town, surrounded by a mud wall, and containing about 2,000 inhabitants. It has four bazars, and the revenue is 35,000 rupees. There is nothing here worthy of notice, excepting that the country as we advanced greatly improved. The fields around were covered with the most verdant grass, and jowaree fields in immense quantities: this is the staple grain; wheat is scarce, and barley still more so. The land between this and the next town gradually rises into gentle slopes, and altogether the country was the best cultivated that we passed through from Roree to Mooltan, and appeared capable of high cultivation. The people, too, seemed better dressed, and more clean, than any we had seen. They are a fine independant race, and as different to the Scindees as day is to night. The people of the

Nawab's territory all call themselves Dadputrahs, a term which will be explained at the end of this. Nowshara is distant from Toreewallah 10 miles. Supplies are procurable, and pretty cheap.

Sumaboo.—This is a small and dirty village, distant from Nowshara 14 miles. The country not so well cultivated as at the last halting ground. Supplies none.

Khanpūr.—This is a very large and thriving town, containing about 10,000 inhabitants, and is distant from Sumaboo 14 miles. It has four good bazars, which are well supplied with grain, &c. Supplies are plentiful and cheap. Khanpūr is connected with the Indus by a large canal, which was covered with boats loading grain for the force before Mooltan. The inhabitants are mostly Hindoos, who reside in the centre of the town; the Mussulmen round about the place. The people seem well to do, and very happy under the mild government of the Nawab; indeed, throughout the country, the people approve of his system of government. The revenue, which is mostly derived from the town, is 60,000 rupees. Grain is not cultivated to a great extent, but indigo is in great quantities, and of which the Nawab has the monopoly. The system adopted is, that the Nawab purchases the whole of the indigo at a certain price per maund of 48 seers, and again sells to the Soucars at a profit of 8 rupees for a maund of 40 seers, thereby gaining a profit altogether of eight rupees and eight seers of indigo on each maund sold; and from this he derives a great revenue. Road very good and broad.

Mumoo-ka-Kanda—properly called "Mahommed Khan-ka-Tandrah"—is a small and almost deserted village, containing a few inhabitants. It is distant from Khanpūr seven miles and three furlongs. The desert comes up almost close to this village, therefore the country is rather barren. Supplies not to be obtained.

Chowderee.—A village distant from Mumoo-ka-Kanda 13 miles. It is almost deserted, and contains but a few inhabitants. Three miles from this place is a large town named "Alloabad," and one of the richest towns in the Nawab's territory. The country around is subject to inundations, and rice is cultivated in great quantities. Our proper route lay through this part of the country, but the Nawab, for some reason or other, best known to himself, sent us through the most barren part of it, and where supplies were very difficult to procure. This zillah is the smallest in size, but yields a greater revenue in pro-

portion—it is said to amount to two and a half lacks of rupees. The Nawab has a large hunting-seat near Chowderee, which he frequently visits.

Chungee-Khan-ka-Gote.—A small village, distant from the last encamping ground 11 miles. It has a large bazar, but was deserted during our stay there. The cultivation is scanty, and supplies scarce and dear.

Ahmedpūr.—A large town, surrounded by gardens. It contains nearly 20,000 inhabitants, and is the residence of the Nawab Bhawul Khan; whose palace (a large white building enclosed within a brick wall, and altogether a handsome structure) is within the town. Ahmedpūr has a very large and well-supplied bazar. Cloth of all descriptions is very cheap, as also almost every description of supplies. It is celebrated for its "Ber" trees, which yield the finest fruit. A large trade in grain is carried on between Marwar and Sindh, and the revenue of the town is 65,000 rupees. The Ahmedpūr zillah is said to yield twelve lacks.

Malikanee Bustee.—This place, which was once a large town, is now almost deserted. It contains a fine Musjeed, and the remains of many fine houses. Its name is said to be taken from a Punjaubee, named Kairoo, a former Malick of the place, who died and left a great deal of money to an only daughter. This daughter built the Musjeed, and a great number of houses. The town rapidly increased, and people flocked to it from all parts. This daughter married, and was at length left a widow with an only son; who, when he grew up, murdered his mother for the sake of her wealth. The Chief of the country put the son to death, and not one of the family now remains. The town from this time went to decay, and now ruin and desolation remain. It is distant from Ahmedpūr eight miles and six furlongs. The road up to leaving Ahmedpūr had been excellent; now, however, it was very difficult, and we had some difficulty in getting out of town. The road was narrow and intricate.

Pholadpūr—is the name of the ferry, over which a splendid bridge was thrown for the passage of the troops. No village near, and supplies had to be brought from a place several miles off. The river is about 150 yards broad here, and is deep—so much so that without a bridge of boats it would be impossible to cross. The country around is very damp, being subject to inundation. Cultiva-

tion scanty. The distance from this to Malikanee Bustee is fifteen miles.

Bughoo—called in the Quarter-Master General's route Gowah—is a small ruinous village, containing but few inhabitants. It is distant from the ferry seventeen miles, and the road, which is very bad, lay through thick jungle. Cultivation very scanty. Supplies none.

Soojāabad.—A nice-looking and good-sized town, with rather an imposing fort, distant from Bughoo fifteen miles. It contains four bazars, which are well supplied. The number of inhabitants is 4,500, of whom the greater number are Mussulmen. There are several gardens outside, as also many houses. The fort was surrendered to Lieut. Edwardes on his advance to Mooltan in June 1848. It might have held out for some time, but the Soucars of the place bribed the garrison to evacuate it and retire on Mooltan, which they did. The garrison were Rohillas, and 400 in number. As a temporary measure, the town and country between it and the river was made over to Bhawul Khan, and was governed by an Englishman named Howell, who is a Captain in the Nawab's service. The revenue under Moolraj amounted to 70,000 rupees.

Adeewallah Bagh.—This is a deserted village, distant from Soojāabad 12 miles. Our road, which was very bad and narrow, lay through a thick jungle, and several times we were compelled to halt. There were no signs of cultivation.

Mooltan—distant from the last halting-ground ten miles—is a large city situated in an alluvial plain, and enclosed within a brick wall with round towers, and from 55 to 60 feet in height in some parts. It is said to have contained, previous to Moolraj's rebellion, 63,000 inhabitants, and was the grand mart of trade between Affghanistan and other parts of Central Asia, and the North-west Provinces of Hindūstan. Its chief articles of manufacture were silks and carpets, which were exported into all the adjacent countries, and are in great demand. The streets, like those of all native towns, are narrow and dirty, with the exception of the principal bazar; but the houses are generally well built, and many of them are large and lofty. The inhabitants consisted chiefly of Seikhs and Hindūs, but a great number of Affghan families inhabited the suburbs, which, from all appearance, and their great extent, must have contained a great number of people. Three sides of the town, viz., the south, east, and west, are covered with houses and gardens as before stated, and densely wooded, although a great

many trees had been cut down during the siege by Moolraj's orders, and others by the besiegers. To the north of the town is the fort, which consists of three different walls of burnt brick : the inner one is the citadel ; it is surrounded by a ditch 40 feet deep, and 30 feet broad, and was dry during the siege. To attempt here to describe the fort will be quite needless, and it will be sufficient to mention that on the north side of it is an open plain, here and there intersected with nullahs. Runjeet Singh captured the place in 1819, and Muzuffur Khan, Affghan, the governor of the fortress, together with his two sons, fell in its defence. They are buried in the citadel, in the area of the dome of the Ruku Ali Shah, which place contains the tombs of many other persons. The shrine of Bhawul Hak, which must have been a fine building, is also situated within the citadel. This latter place is now a mere ruin, having been greatly battered during the siege. Many other buildings were destroyed at the explosion of the magazine on the 30th December 1848. Mooltan may, in fact, be called a city of tombs and temples, objects of veneration to both Hindūs and Mahomedans : during the time of Aurungzebe large ships were able to come close up to the walls of the city, but now no trace of a canal or river remains. The glory of Mooltan has departed, and very many years must elapse before it can possibly recover itself, or regain an item of its former wealth and importance.

Megree.—This is a deserted village, distant from Mooltan fifteen miles. Cultivation scanty and neglected. Turnips seemed to be mostly cultivated, as indeed throughout the province. Our road lay across an open plain, which at first was tolerably good, but bad at the latter part. We crossed two canals, which were then dry. This village is styled Inaampūr in the Quartermaster-General's route.

Wustee.—This is a deserted village, with very few inhabitants. The country is badly cultivated, and no supplies are to be obtained. It is called Kokah in the route, and is distant from Megree 11 miles.

Camp, right bank of Ravee.—Our road this day lay near Sirdārpūr, a large village with a fort and bazar, but almost deserted by its inhabitants. The fort is built of mud, and the village is surrounded by a mud wall. The country is an almost perfect plain from this place to Goozrat, and near the banks of the Jhelum ; and was covered with beautiful green grass, and well wooded. The country cultivated, but turnips appeared to be chiefly grown. Supplies are procurable but in

small quantities. The distance from Wustee is 15 miles. Road pretty good.

Jellalpūr.—A large village, containing about 200 houses, and about seven hundred inhabitants. The country round is well cultivated, and yielded last year to Moolraj 20,000 rupees revenue. A great number of the inhabitants have left it, and the bazar contained merely a few shops, which were scantily supplied. Barley is the staple grain. Jellalpūr is distant from the last halting ground twelve miles. A great number of the inhabitants of this place came out to see and make their salaams to Moolraj : indeed, almost at every village the people turned out to pay him this mark of respect. His character stands high with the people of the province.

Shorkote.—A town in the zillah of Jhung, with a large bazar, and the ruins of a large fort on an eminence close to it. This place was plundered by Shere Singh's force, and is now almost in ruins, and deserted by the greater part of its inhabitants. On the east side of the fort is a village, which is chiefly inhabited by Hindoos, and contained a good bazar. The fort is said to have been built by Shere Shah about the middle of the sixteenth century, and was a place of importance. In the year 1847 it yielded 35,000 rupees revenue. Near the village is the shrine of a Mussulman saint. The distance from Jellalpūr is ten miles.

Kaimpūr.—A small collection of mud huts, distant from Shorkote ten miles, and a mile and a half from the banks of the Chenab. The cultivation was very scanty, and supplies not procurable.

Mulwanee.—A village containing 400 inhabitants, and a few Banyans' shops. The country round is covered with grain fields, of which barley predominates: yields a revenue of 10,000 rupees. Supplies none. The Chenab is distant about four miles from this village. From Kaimpūr the distance is 12½ miles.

Jhung.—Also called Jhung-i-Seal, from a Punjaubee tribe of Mussulmen, who first inhabited it. Is a large town, containing 6,000 inhabitants, of which two-thirds are Hindūs. The town is surrounded by a wall twenty feet high, and has a small fort of no strength. We passed through a highly cultivated country until we came within a mile or so of Jhung, which is very barren and sandy. The revenue of the zillah is three lacks of rupees, but the town of Jhung yields only 3,000. The bazar, which is rather famous for a peculiar sort of rice, is well sup-

plied, and articles are tolerably cheap. We passed a large village named Maidānáb, a mile and a half from Jhung. The distance from Mulwanee is thirteen miles.

Kewah (Kewalee in the route.)—Is a small and ruinous village, distant from Jhung thirteen miles. The country on all sides covered with barley, which is almost the only grain cultivated. Horses are obliged to eat boussa, or chopped straw, no forage being procurable. The road was pretty good, and lay through an open country, almost destitute of trees.

Bowanee.—Is a small village, containing forty huts, and distant from Kewah fourteen miles. The country is open, and contains little or no cultivation. Road good. Supplies were not procurable, neither forage.

Būkaree.—This village, which contains about 100 inhabitants, is distant from Bowanee fourteen miles. The country towards the east is barren, but to the west is tolerably well cultivated. The Chenab is distant from this village one and a half miles to the north-west. Supplies are procurable in small quantities.

Chūneout. — This is a large town, with a fort, and containing 4,500 inhabitants. The houses of the town are large and well built. The fort sustained a siege of three months from the force of Shaik Emaum-ood-Deen ; and contains near 300 houses, which were inhabited by Seikhs. The inhabitants of the town are two-thirds Hindūs and Seikhs, the remainder Mussulmen. A mountain rises up abruptly to the west of the town, and completely commands both it and the fort. The country is barren in many places ; the cultivation, as we might expect, was neglected, and supplies were very difficult to be obtained. The revenue of the town was in 1847 about 55,000 rupees. Distant from Būkaree nine miles, through a very open country, and by a very good road.

Shaik Ameer.—A small village, containing very few inhabitants : is distant from Chūneout ten miles, and three miles from the Chenab. This is the last village in the province of Jhung, and here we first beheld the Pind Dadun range of mountains.

Buttian-ke-Pindee.—A thriving town, containing about 1,300 inhabitants, the greater number of whom are Seikhs. It is distant twelve miles from Shaik Ameer. The cultivation is pretty good, the country open, and the road tolerable. Supplies scarce.

Jellalpūr.—This is the chief town of the zillah of the same name, and is surrounded by a wall. It contains about 5,000 inhabitants, and yields a revenue of 50,000 rupees. The bazar is large and well supplied, and is famous for the wheat which is grown in the neighbourhood. The Seikhs are the principal inhabitants,—the remainder are Hindūs and Mahomedans. Jellalpūr, amongst other things, is celebrated next to Rawul Pindee for the beauty of its dancing girls and prostitutes, who are numerous. The distance from the last encamping ground is thirteen and a half miles. The surrounding country is open and well cultivated.

Wanegah.—Is a small collection of huts, distant from Jellalpūr fifteen miles. On our arrival here, we were ordered to march in two hours on Ramnuggur : I had therefore no time for observation. The country badly cultivated : road good.

Ramnuggūr.—A large city, containing about 11,000 inhabitants, and surrounded by a wall with round towers. It has eight well-supplied bazars, and articles are very cheap. On one side of the city there are several gardens, but, with this exception, the surrounding country is sandy and barren. We arrived here at night, after a forced march of eighteen miles from Wanegah, and departed again the next morning. It is called Ramnuggūr by the Seikhs, and Russoolnuggur by the Mussulmen.

Camp of the Commander-in-Chief.—We marched through an uncultivated tract for about half a mile to the bank of the Chenab, where we crossed over by the bridge. On the opposite bank, the soil was sandy for some distance, but improved as went on, and towards the latter part the country appeared one vast grain-field. The road was bad, being intersected by ravines and nullahs filled with water. The distance from Ramnuggūr is about twenty-one miles.

Goozrāt.—We marched this day a distance of about five miles, and took up our position in rear of the town of Goozrāt, and distant about two miles. The country was highly cultivated as far round as the eye could reach, and tolerably well wooded. Goozrāt itself is a large and imposing-looking town, with lofty embattled walls and round towers. I had no opportunity of visiting it, and I have therefore been unable to state anything more concerning it with certainty.

Jorah—called Chuck in the route—is a small collection of huts, situated in a low jungle, and is seventeen miles from Goozrāt. We passed

close to a large village, but were unable to see much, as a frightful dust-storm was blowing at the time. The country appeared barren, and overgrown with a low thick jungle.

Khonee—(Maidān in the route.)—A deserted village, containing about thirty huts, and distant from Jorah fifteen miles. The village had been plundered by the Seikhs in their retreat.

Shaik Secunder.—This is also a deserted village, distant from Khonee thirteen miles. About a mile to the east of the road on a rising ground is a large tank. The road was bad, and the country, which was covered with a dense dwarf jungle, was intersected with ravines and low hills.

Aorungabad Serai.—This is a large Serai, with a village containing about 150 houses within its walls. It has two gateways, and contained but few inhabitants, the place having been plundered by the Seikhs. It is about two miles from the river Jhelum, and opposite to the town of that name. Aorungabad, which is a large village, is four miles distant from the Serai. The distance from Shaik Secunder is 13 miles. The country appeared less barren, and was slightly cultivated towards the river. Supplies procurable in small quantities.

Soockchainpūr.—Is a collection of mud huts near the village of Chuck, and distant from Aorungabad Serai seven miles. Our road lay along the bank of the Jhelum, and through a well-cultivated tract of country.

Kālah Deh.—Is a small village containing about one hundred inhabitants, and is situated on the right bank of the river Jhelum, and three miles from the town of that name. This place is called Pookwallah in the route, but Kālah Deh is the term used by the people themselves. The town of Jhelum is very clean and well built, and has a large bazar, which contained no supplies. The town had been evacuated but two days before by the Seikhs, and was therefore nearly deserted. There had been a bridge of boats across the river to this place, but it had been burnt by the enemy. We had to cross five different branches of the river, two of which were very deep, and much of the baggage was lost and damaged. Camels might be seen, together with their burthens, floating down the stream, but by the assistance of the mussuck-wallahs, who are a very willing, active, and expert, set of men, both camel and burthen was generally brought to land. The left bank of the river is rather low, but the right bank is high, and in many places steep. The mountains of the salt range between this place and Attok, are entirely lost to the eye to the south-west. The country

around was well cultivated, and barley as usual appeared to be the staple grain.

Rhotāss.—This is a very extensive but ruinous fort, encircling a rocky hill some three or four hundred feet in height. A winding path leads to the great gate, which is about three hundred feet above the level of the surrounding plain, and is of immense proportions, and built entirely of stone, as is the whole fortress. The walls are at least seven miles in circuit, and forty feet thick. It has suffered from earthquakes, and one immense mass of wall, some 150 feet in length, has been thrown into a ravine below. In a military point of view, Rhotāss is of no strength: in the first place, it is commanded by hills on all sides, and in the second place, it would take an immense army to garrison it. It has three gates, one of which is as fresh and sharp as if built but a few years. The stone used in the building is sand-stone of a yellowish colour, and cemented with lime. An inscription over the principal gate says that the fort was built by Shere Shah (Sodee), who usurped the throne of Delhi about the middle of the 16th century. When the dethroned monarch Humaioon returned to India from Persia, where he had retired for the purpose of collecting an army, the fort of Rhotāss was surrendered by its Governor, Tatar Khan, without opposition. Previous to the invention of gunpowder, or to an enemy unprovided with artillery, the fort of Rhotāss would be impregnable, but, as before mentioned, the immense garrison that would be required even to man its walls, must have been a great drawback in its defence. The space within the walls is intersected by immense ravines in several places. There are two large wells with steps to go down: one is filled up with rubbish; the other, although nearly dry, is in good repair. There are 164 steps to the bottom of this well, all of stone. There is a village also containing about 500 people, most of whom are Hindūs. Amongst the sights is that of a Seikh fucqeer, named Matab Singh, who has remained for sixteen years sitting in the same spot. He is almost skin and bone, and is fed on milk and sweetmeats, and never tastes bread of any kind. Our road after the first two miles lay through the mountains by a sandy road. We crossed seven different streams, and the whole country until close to Rhotāss bore no marks of cultivation. Afterwards the country is more open, and close to Rhotāss is well cultivated, but without trees. The distance from Kalah Deh is 13 miles. Ferishtāh states that there was a Fort here four centuries before the Christian Era.

Unduranā or Jughee.—Is a small village, built entirely of stone, with thatched roofs, and bore a strong resemblance to cottages at home. It is situated to the left of the road, and contains about 100 souls. It contains one shop, which is that of a cutler, who manufactures knives said to be famous in this part of the country. The distance from Rhotāss is 9 miles, through a country which, though to all appearance capable of cultivation, seemed deserted.

Buckrālā.—Is distant from Jughee 10 miles by a road winding through the mountains, and ends in the Pass of the same name. The most difficult part is this, the road winding up the almost perpendicular face of a hill more than 500 feet in height, and very difficult for artillery and camels. At the top of the pass, and about 2 miles distant, there are three small villages, the largest of which contained about forty houses : a great many of them were in ruins. One half of the inhabitants had fled on the approach of the Seikhs, and nothing in the shape of supplies was procurable, except in very small quantities, there being but two shops in the place. The cultivation was good, but the young grain had been cut for forage, no other being procurable. There is a Shrine, and a stone fountain which is now dried up.

Damuk—(or Sawun Mull-ke-Tulao in the Route)—is the name of a small village, which had been burnt and plundered by the Seikhs a few days before, and deserted by its inbabitants. It is distant from Buckrālā 9½ miles, and three miles nearly from the Tank of Sawun Mull. Country a delightful green; the corn-fields however trodden down, and cut in many places for forage.

Pukkah Serai—so called from the remains of one of those Serais erected by the Delhi Kings for their own convenience whilst travelling betewen Delhie and Kabūl. We crossed the dry bed of a mountain torrent, and several ravines; with these exceptions the road was pretty good. The distance from Damuk is 14 miles.

Wikaláyá—is a large village, containing about 400 inhabitants, and near the celebrated Tope called generally the Municyala Tope. The country around is exceedingly well cultivated, and the people possess numerous droves of cattle, buffaloes in particular. From Rhotāss to this place, the scarcity of cattle was remarked by every one : not a cow or a buffalo was to be seen—even goats were very scarce. There is a small fountain in the village. The distance from Pukkah Serai is thirteen miles. The road, as usual, intersected here and there by

ravines, rivers, etc. The most remarkable object is the Búrj or Tope, which is supposed to be an ancient Bhuddist monument, inside of which it was customary to deposit some relic of the God. The Tope in appearance is like an immense beehive, and is about 80 feet in height and 400 in circumference. Outside it is faced with stone and cement, and on the top there is a well of no great depth. General Ventura, whilst in Runjeet Singh's service, caused the Tope to be opened, but nothing was found inside of any consequence, excepting a few Bhuddist coins.

Hoormuck.—There are two villages near this place, one to the south of the road, called Boweree, and near which is a cistern of water, beautifully clear. The other village is to the north. They each contained about 150 people. The river Sowájáh flows in front at a distance of 1½ miles. On the Rawul Pindee side the banks are three or four hundred feet high; and with great difficulty the guns were got up to the top of the pass, by which the table-land is gained. The Seikhs brought their guns to the top of this pass, where they surrendered them. Our road from Wikalaya to this was very difficult and story. The country round Hoormuck was well cultivated, and well watered. The distance marched was 9 miles.

Rawul Pindee.—A pleasantly-situated and cheerful-looking town, surrounded by mountains, and distant from Hoormuck 6 miles. Three ranges of mountains rise to the west: towering above all may be seen the snow-capped Pir-Paujál range, which divides us from Cashmeer. The town of Rawul Pindee contains about 3500 inhabitants, and yielded a revenue of 30,000 Rupees. The houses are low and flat-roofed, but the streets are clean, and there is a good bazar, and has a thriving trade. To the south of the town there is a large Dhurrumsala, with a well and garden, and to the west is a large Musjeed, and shrine of a Mahomedan Saint named Ali Shah: his descendants live round the place. There is a large building in the town called the Killah, although no fortification. It was the residence of the unfortunate Shah Shoojah previous to his last expedition to Affghanistan. It is nothing more than a large house, such as may be seen in any large town. The country round was well cultivated, but the corn-fields had been greatly injured by the Seikhs. There are numerous ravines round the town, as also a great many nullahs filled with water, of which there is no scarcity whatever. A short distance from the town, in the hills, are places suitable for sanitary stations, and which are delightfully cool all the year round. The

distant mountains seemed well wooded, of which the Fir tree appeared to be in the greater proportion. The inhabitants of Rawul Pindee are mostly Mahomedans, who are a very civil and hardworking set of people, not only here but throughout this part of the Punjáb. This town is, and may be, justly celebrated for the fairness and beauty of its prostitutes. It is the nursery of this class, who are sent out to all parts of the country, and therefore they are in strong force. As to the beauty of these women there is no doubt, and very many persons were struck with astonishment at beholding them. The poor creatures are to be pitied, for their beauty is worthy of a better fate.

Janee ke Sang.—A small fort with a mud wall, enclosing about 12 houses. The fort is in ruins, and is distant from Rawul Pindee 15 miles, by a road as usual intersected by ravines. A short distance from this place, on the road to Hassan Abdal, is a paved road through a mountain, and called the Mūlgalah Pass, and is the imperial road from Kabul to Lahore and Delhie. This pass was cut, and the road built, in the year of Hijerah 1070 by Mahábát Khan (Affghan). The following is the translation of an inscription cut on a stone on the left of the road: it is in the Persian language:—

"Ali Khan of the strong hand, powerful and revered,
The paw of the Lion is weak in comparison to thy hand;
For in the mountain of Narkilah, which in height is like the canopy of Heaven,
Thou of thy goodness didst make a road, that the whole of the creation might pass through.
Meerza Haider, Acranee, Superintendant.
Abdoolah, Hindee, Architect & Builder."

After leaving the Pass we came to the ruins of several stone bridges, and had to pass as usual over deep ravines. The country round barren and stony in appearance, and the jungle, which is composed chiefly of dwarf acacias, is densely thick.

Hassan Abdal.—This is a small town containing about 120 houses, but was deserted by its inhabitants, the most of whom are Seikhs, on the arrival of the Affghans, who had plundered and burnt the place; as also the village of Wah, which is about a mile distant. There are two bazaars, which contained nothing in the shape of supplies: fifteen Hindús, however, did return previous to our departure. Hassan Abdal, which is mentioned in Moore's *Lalla Rukh*, is a beautiful place. The country is well watered, and is covered with the most verdant grass. A

short distance from the town are the remains of a Serai built by the Emperor *Akbar*. There are a great many cypress trees, also a tepid spring, in which sacred fish were kept. The Delhi Kings always stayed at Hassan Abdal on their way to Kashmir, and the remanis of a palace built by Jehangeer may still be seen. In the court are three springs, which gush out of the ground, and which feed several tanks filled with the finest fish. To the right of the road, a mountain rises up abruptly, on the summit of which there is a small musjeed. Attok can be seen from this place, as also the junction of the Cabul river with the rapid Indus. About a quarter of a mile from Hassan Abdal, on the Attok road, there is a place enclosed by walls, inside of which two beautiful cypress trees throw their cooling shade over a tomb, said to be the last resting-place of Nūrjehān, the wife of Jehangeer. The door at the entrance of the enclosure has been carried off, but the frame, which is of black marble, still remains. Hassan Abdal derives its name from a Peer of that name who is buried at Kandahar, and known there by the name of Baba Hassan. The distance from Janee ke Sang is 14 miles.

Shumsabad.—A small village containing 400 inhabitants, the whole of whom are Affghans ; and is distant from Hassan Abdal 15 miles. There are two other small villages a short distance from each other, together with a tank, to the west of Shumsabad, at about a quarter of a mile distant, and which are also inhabited by Affghans : indeed this is the commencement of the Affghan country, and is highly cultivated on all sides. In the year 1847 it yielded 15,000 rupees of Revenue. The road is bad and stony, and intersected with morasses : in many places mountains rise on all sides, which are covered with a thick jungle of dwarf acacias.

Attok.—A Town and Fort on the left bank of the river Indus, and distant from Shumsabad 10 miles. The road is over a vast plain, intersected by numerous-water courses and ravines ; and altogether the country is of a barren and uncheerful aspect. The town contains nearly two thousand inhabitants ; of whom a large proportion are Seikhs. It is situated to the south of the Fort, and close to the river's bank. The Fort, which was built by *Akbar* in 1581, is a large irregular building of no great strength, being commanded by hills on both sides of the Indus, and is constructed of brick and stone. Inside the Fort there are about 100 houses and a bazaar. The river, which is of a clear blue colour, flows beneath one of the bastions of the Fort, and

in the cold season is about 400 feet in breadth and 30 in depth. During the inundation the breadth increases to as many yards : and is from 70 to 80 feet in depth, at which time the stream is very rapid, and of immense force. Two miles above Attok, where the Cabul river joins the Indus, the banks are low and sandy, particularly the left bank ; and the river is here divided into several branches, which become one stream at a short distance above the Fort. Close to the Fort the banks are rather high and rocky ; and the rocks from the force of the stream are polished and smooth like marble : they are of dark blue slate. Below Attok the mountains rise up abruptly from the river to 1000 feet in height, and the width of the stream gradually decreases. The usual manner of crossing this river is similar to that in Punjaub, viz. on inflated skins. One of the Nimroud marbles just received at the British Museum represents a party of soldiers crossing a river ; several of them are on inflated skins, holding the aperture to the mouth by the left hand, and steering themselves with the right, which is precisely the same as practised by the Punjaubees. On our march to *Peshawur* in March 1849 there was a bridge of boats across the stream, but when I again visited Attok in June the bridge had been completely destroyed, for that year at least. The bridge was formed of boats placed at short intervals from each other, and moored to large stones, kept together by wooden frames ; over which planks, branches of trees, earth, &c. &c., are placed. During the time of the Seikhs, the boatmen of the bridge received their pay out of the revenues of a small village, set aside for that purpose by the Sirkar. The revenue of Attok, which included a few small villages under the Seikh Government, was 70,000 Rupees. The plain of Attok, otherwise called the " Plain of Shush," has been the scene of many a conflict between the Seikhs, under Runjeet's General Mokkum Chund, and the Affghans, under Futteh Khan, the Wuzeer of Mahommed Shah of Cabūl. Opposite to Attok is the fort and village of Khairabad, said to have been built by the Emperor Akhbar, although there is but little doubt that it was built by Nadir Shah. It is a place of no strength, consisting of a wall with round towers at short intervals, and is in the form of a square ; and built entirely of stone. The village is small, and contains about 150 inhabitants, and has a small bazaar.

Nowshara.—A town 20 miles from Attok, on the left bank of the Kabul river, with a Fort on the opposite bank, and a few shops. It contains about 2,000 inhabitants, the whole of whom are Affghans. The

revenue is about 20,000 Rupees, and the country round it is in excellent cultivation. On leaving the right bank of the Indus, the road leads through a rather difficult pass between lofty mountains for a distance of three miles, after which the country is more open, but barren and uncultivated,—except towards the hills on the west, and on the left bank of the Cabul river,—until you approach within a few miles of Noushárá, when the beauties of the plain or valley burst into view. On all sides the country is clothed in the richest verdure, which continues all the year round. Many plants of European growth and flowers also might be observed, as also a beautiful sort of heath, which made the plain for miles in many places appear of the brightest purple colour: in the account of *Peshawur* I shall more fully describe it.

Chumkunnee.—A small village containing about 500 inhabitants, and most beautifully situated. The Mulberry trees are very beautiful; as also the peach, apricot, apple, and cherry trees round the villages here. The revenue of this village alone is said to be 10,000 Rupees. The country is intersected by water-courses at almost every step: some of them have bridges, but for the most part they are without. The road leads through a country which is cultivated on all sides: no spot appears without some cultivation or other, and to describe one village is sufficient for almost every one. They are all most beautifully situated, and embowered in trees. Our next march was to *Peshawur* and Jumrood: the distance to the former is six miles, and the latter place seventeen miles. A description of *Peshawur* I defer to a future period, when I hope to be able to describe it fully.

ART. VIII.—*On the Sathpoora Mountains.* By Lieutenant C. P. RIGBY, 16th Bo. N. I., Western Bheel Agent.

THE Sathpoora Mountains, which for a distance of about fifty miles north-west of the Scindwa Pass form a rugged precipitous barrier separating the valley of the Nurbudda from that of the Taptee, separate into two branches to the west of Torun Mal, enclosing between their north and south faces an irregular elevated table land, varying from fifteen to thirty miles in breadth. The mountainous district which thus forms the water shed between Khandeish and the valley of the Nurbudda, is inhabited by various aboriginal tribes of the Tamulian race, which, owing to the difficult approaches to, and secluded situation of, these highlands, the dense insalubrious jungles which surround them for many miles, and the terror inspired by the predatory tribes and wild beasts which inhabit the forests below, have for ages dwelt in unmolested freedom, have had little or no intercourse with the inhabitants of the plains, and have preserved amidst the political and religious revolutions of centuries, the manners and religion of the aboriginal inhabitants of the country, unmixed with any of the debasing superstitions and cringing servility of the inhabitants of the plains.

2. Owing to the above causes, the simple natives of these mountains form perhaps at the present day the purest type to be found in any part of India of the aboriginal Tamulian race, and of the religion and manners of the people before the Brahminical faith had spread its dark superstitions over the land, and crushed all feelings of independence and freedom, and as very little is yet known respecting these interesting people, and their mountains have hitherto been visited by very few Europeans, the following observations on this district and its inhabitants have been compiled, as perhaps tending in a slight degree to assist in the investigations of the character and language of the aboriginal races of India, —a subject which has lately excited some curiosity and attention.

3. The Akranee Purgunna, which embraces this district as far as the Mowass State of Katee, follows the general direction of the Sathpoora range, extending for about sixty miles from East to West, with a breadth from North to South varying from fifteen to thirty miles. It is bounded on the South by the Sooltanpoor and

Kokurmoonda Purgunnahs and the Mowass States of Boodhawul and Nal; on the North it is bounded in its entire length by the Nurbudda; on the West by the Mowass State of Katee; and on the East by the Burwani State and Torun Mal up to the Hawassea gate. Its entire surface is very mountainous, the most elevated parts of the range being the North and South faces, enclosing a succession of low ridges running parallel to them. Between these are many fertile valleys and table lands watered by numerous streams, which at all seasons of the year contain a plentiful supply of good water: the lower hills are undulating, and the soil being a rich decomposed iron stone, abundant crops of jowarree and other grains are produced on them. The higher ranges of hills are covered to their summit with thick jungle, and, besides a never-failing supply of timber and fuel, furnish the inhabitants with many valuable drugs and dyes. The general surface ranges from 1600 to 2500 feet above the plains below, and this altitude causes the climate during the hot season to be very temperate, but during the cold season the cold is said to be severe, ice being found in the nullahs and wells: during the Monsoon the fall of rain is excessive, the sun seldom being visible, and the earth being enveloped in mist. The scenery is very diversified and picturesque: the valleys and level lands are divided into regular fields with strips of grass growing between each. The villages and groups of huts are usually surrounded with groves of mango and mawa trees. The banks of the numerous streams are verdant all the year round: date and brab palms thickly dot the landscape; and the higher ranges of mountains, in every rugged form, bound the view on either side.

4. The principal rivers and streams which take their rise in, or traverse, this district, are the following:—The Oodey, which, after traversing the entire district for about sixty miles, falls into the Nurbudda near Bhoosa: it is a considerable stream. The Utkhurree, which, after a course of about 50 miles from West to East, falls into the Taptee near Chicklee: it is a large rapid stream at all seasons. The Jhurkun river, which rises near Torun Mal, and after winding for about forty miles through the hills, falls into the Nurbudda at Bhadul: it always contains a good deal of water. The Hutnee river, which forms the boundary between Khandeish and the Burwani State: it falls into the Nurbudda below Torun Mal. The Ghogala river, which rises on the South slope of the hills near Wallere, and after a course of about thirty miles, falls into the Taptee near Kokurmoonda. The Hut-

tee river, which escapes from the hills after a course of a few miles, and falls into the Taptee near Tulloda: it contains a considerable stream at all seasons. The nullahs and small streams are too many to enumerate; the largest are the Jamneh nullah, Bhoomani nullah, Pandree Jirah, &c.

5. There are five passes leading from Khandeish and the Nurbudda into the Akranee Purgunna. The most frequented is the Nowagaum pass leading from Shada: it is an easy track for bullocks and horses. The Chandseli Ghaut, leading from Kokurmoonda and Tulloda: it is a steep and difficult track; horses can ascend it, but with difficulty. The Dadobawa Ghaut, situated between the two former, is passable only by foot passengers. The Soorpan Pass, leading from the Katee State: it is somewhat difficult, but is much traversed by Brinjaries from Goozerat and the Rajpeepla State. The Oodeypoor road, leading to the Nurbudda by the Kurrai-pain Ghaut, is said to be very difficult, and little frequented. The only strangers who are in the habit of penetrating these hills are Brinjaries from Shada in Khandeish, and Nandode in Rajpeepla: they supply the inhabitants with salt, groceries, &c., and purchase from them their surplus agricultural produce. The quantity of grain annually exported from the district is estimated as follows:

Description.	By the Nowagaum pass to Shada.	Via the Chandseli Ghaut to Kokurmoonda & Nundoorbar.	Via the Dadobawa Ghaut to Tulloda	Via the Soorpan Pass to Katee and Nandode.	Via the Kurraipain Ghaut to the Nurbudda.
	Maunds of 128lbs.	Maunds of 128lbs.	Maunds of 128lbs.	Maunds of 128lbs.	Maunds of 128lbs.
Bajree	500	200	...	500	200
Jowaree	800	500	...	300	500
Oorood (Phuscolus radiata)	10	7	...	...	...
Mordun	600	300	...	300	...
Indian Corn	300	100	...	200	...
Toor (Cytisus Cajan)	25	12	...	...	...
Chowlee (Portulaca quadrifida)	200	100	...	100	...
Salmun	2	...	...	25	...
Bhurtee	...	...	...	300	100
Naglee (Cynosurus Corocunus)	...	...	...	100	100
Moogh	50	25	...	...	...
Total exported	2487	1244	...	1825	900

Besides which the following articles are exported to Khandeish by the Chandseli and Nowagaum Passes, viz :—

Description.	Maunds of 80 lbs.	Estimated Value.
Charolée (Chirongia Sapida)	100	Rs. 800
Mowa (Corollæ of the Bassia latifolia)	4000	4000
Kat (Extract of the Memosa Charida)	40	80
Honey	200	800
Bees' Wax	25	500
Lac (Coccus Lacca)	20	80
Gums and Resins	10	20
Total	4395	6280

6. The total amount of revenue paid to Government by the inhabitants of the Akranee Purgunna is Rupees (2611) two thousand six hundred and eleven per annum, and as the value of the produce exported, as shewn in the above tables, is estimated at Rupees 14,100, it shews that the material condition of these Tribes is far more prosperous and thriving than that of the peasants in the plains: added to which, they have no Banians amongst them to tempt them to run into debt.

7. The total number of inhabitants of this district is 4467, all of whom are exclusively engaged in agriculture. The number of inhabited villages is one hundred and nineteen, and of uninhabited six, four of which were deserted last year in consequence of an encreased amount being assessed upon them—the inhabitants of these villages having gone to settle in the Katee State. The land throughout the district is assessed by Outhbundee or engagement to pay a fixed sum for the use of each plough and pair of bullocks, with which the owner may cultivate as much land as he pleases. The sum paid for each Outh is fixed at rupees nine per each Pawria peasant, and rupees five for each Wurralee. The total number of Ouths is 506. The fields appear to be very carefully cultivated, are kept very free from weeds, and are well manured. The rotation of crops is observed. On a piece of land being newly cleared for cultivation, the felled wood is strewed over it and burnt: in the beginning of July, bajree is sown, and reaped in January; the next season jowaree and toor are grown; these are followed by a crop of gram; and the fourth season by rice or bhurtee. Mor, naglee, &c., are usually sown in the poorer soils on the sides of the hills: the seed is scattered with the hand. The plough used is of the most simple description,

with an iron share about a foot and a half in length. No carts are used in the district. The assessment is very light to a peasant of moderate industry, for the soil of the lower lands is very rich, and produces every variety of grain except wheat. They have, besides, no payments to make to priests or temples, and there are no mendicants amongst them. They possess large herds of cattle and a few buffaloes: rich pasture is abundant along the banks of the nullahs, but some hundreds of cows are said to have died of the cow-pox during the last few months. They have no sheep or pigs, but poultry and goats are very abundant. Scarcely any vegetables or oil plants are grown: oil for cooking is expressed from the nuts of the Mawa (Bassia latifolia), the flowers of which also furnish them with abundance of liquor. Although palm trees abound, no use whatever is made of them, the people being apparently ignorant of the method of distilling spirits from their juice. Lights are never used, the people going to bed at dusk, or sitting over a wood fire.

8. Little can be ascertained on the spot respecting the former government and history of this secluded district: the south part of it, as far as Dhurgaum, was nominally included in the Mahommedan kingdom of Khandeish; to the north of this, as far as the Nurbudda, it was governed by its own Chiefs. After the decline of the Mahommedan power, the district was left without any ruler, which caused Chowjee Rana of Dhuswye to cross the Nurbudda and establish himself in it. At his death he was succeeded by his son Rana Gooman Singh, who built the fort of Akranee, and established comparative peace and quiet. His son, Rana Himmah Singh, ruled twenty-eight years: he had two sons, Rana Baboo and Rana Gooman: the former died during his father's life, the latter ruled twelve years. At his death, without heirs, great disturbances occurred, and many of the inhabitants fled into the Oodeypoor State. Bhow Sing, Rana of Muthwar, the adjoining district to the west of Akranee, then succeeded to the Gadee, and built the fort of Roshmal (now in ruins,) and induced the people who had fled to return to their homes. Bhickajee Bhao, the son of Rana Bhow Sing, succeeded his father, and ruled five or six years: having murdered Junjar Bheel, Naik of Chicklee, situated below the hills near Shada, the son of the latter, Dewajee Naik, the present Mowass Chief of Chicklee, and head of the Sultanpoor Police, made a foray into the country, surprised the fort of Roshmal, and murdered Rana Bhickajee Bhao, in revenge for his father's death. In consequence of this, a detachment of the Peish-

wa's troops came to attack Dewajee Naik, and took possession of his country: they occupied it for about a year, when the occupation of Khandeish by the British caused them to quit. Rana Bhickajee Bhao was the grandfather of the present Rana of Akranee, Rana Jeswunt Singh, who is an intelligent lad about sixteen years of age, residing at the village of Purtabpoor, below the hills, which he holds in Jagheer, together with an annual allowance of rupees 2868 in lieu of the Akranee Purgunna. I may mention en passant, that Dewajee Naik is now a devout Muslim, forming a curious instance of one of several Bheel Chiefs in the west of Khandeish who during the last few years have been converted to the Mahomedan religion.

9. In describing the inhabitants of this mountainous district, I include also those of the Katee and other Mowass states, and also the inhabitants of the dense forests situated along the south pass of the Sathpooras. They consist of three principal tribes, viz.—the Pauria, and the Wurralee, which are confined exclusively to the mountains of Akranee and Katee, and the tribes which are simply called Bheels, without any other distinguishing name, which inhabit the forests between the base of the mountains and the Taptee. The Paurias are distinguished from the others by their superior degree of civilization, their agricultural habits, and their language: they deny that they are Bheels, and consider the name a reproach;—they certainly differ in many essential points from Bheels, and probably the only reason why they have always been classed as such is that they are not Hindoos. They hold no intercourse with the Wurralee or other Bheels, upon whom they look as an inferior race to themselves; and doubtless they have some cause to pride themselves upon their fancied superiority, for in the revenue settlement of the Akranee Purgunna, each Pauria cultivator is assessed at four rupees per plough or outh more than his Wurralee neighbour, merely owing to his superior knowledge and mode of cultivation.

10. The name of Bheel is so generally associated in the minds of Europeans and natives of the plains with ideas of barbarism and predatory habits, that few would expect to find several tribes of this race which have been for ages peacefully occupied in tilling the soil, and tending their flocks and herds, and distinguished by many moral qualities above the Hindoo inhabitants of the plains. Their simple state of society, in which all are equal, together with the absence of any towns and petty trade, are very favorable to the development of their amiable qualities.

Though at first shy of strangers, from seeing so few, yet, when their confidence is once gained, they are very cheerful and communicative, and totally devoid of all Hindoo prejudices: they are very honest and industrious, and the utmost reliance may always be placed on their word. Like most mountaineers, they are ardently attached to their own mountains, and seldom venture out of them. As an instance of the dread with which a distant journey inspires them, a young Pauria peasant, who was bound over to give evidence before me at Malligaum in a case of homicide, went home, and, having spoken of his dread of his approaching journey, immediately committed suicide.

11. In person, the Pauria peasants are usually short and slightly built. Their features bespeak great intelligence and good nature: their physical type differs materially from the Hindoo, the features being more flat, with low round foreheads, wide nostrils, and thicker lips: they wear moustaches, but pluck out the beard; they usually wear a pair of large silver earrings, the weight of which frequently draws down the lobes. The women are stout and buxom, and, when young, are very comely:—their features present much greater variety of expression than amongst the Hindoo: they are usually much fairer than the peasants of the plains—probably from their not being required to perform so much outdoor drudgery as the latter. The Wurralees are strikingly different in appearance, being tall and dark, very slim, but well made: their features more resemble those of the Negro. They wear no head dress, but part their hair in the middle, and wear it flowing loosely over their shoulders. The Wurralee women usually go naked to the waist: they wear a great many massive brass rings on each leg, extending from the ancle half way up the calf—they are fitted on so tight that they cause the flesh to shrink: these are never removed, and at death are buried with them. The Pauria women have usually more clothing, being in better circumstances, but they do not consider that any want of modesty attaches to the exposure of the person to the waist: they wear brass rings on their legs, like the Wurralees, and also several massive necklaces composed of brass and pewter beads, silver armlets, and massive silver earrings two or three inches in circumference: on the death of a woman, all her ornaments are buried with her. The Bheel women below the mountains also go naked to the waist, but their breasts are partially covered by a number of massive necklaces of cowries, and rough pieces of coral and agate: altogether, their ornaments present a most unwieldy uncomfortable ap-

pearance; and, from stopping the circulation of the blood, must injuriously affect their health. The inhabitants of the mountains appear to be healthy and robust: intermittent fevers are said to prevail during and after the monsoon, and I noticed several cases of enlargement of the spleen. Cutaneous disorders are also common, owing probably to the scanty supply of vegetables. The inhabitants of the low jungles are a miserable race,—squalid, sickly, and undersized: almost all of them have enlarged spleens, and their whole appearance bespeaks the insalubrity of their climate. In civilization and industry they are far behind their Highland brethren, and have at all times been notorious for their unsettled predatory habits. Small pox makes great ravages amongst these people: I was informed that between two and three hundred of the Paurias were carried off by it during last year. I tried in vain to induce the Wurralees and low country Bheels to submit their children to vaccination, but with the Paurias I had little difficulty: after going about a few villages with the Hospital Assistant, and explaining its object to them, they willingly brought their children out, and after a few days, young and old came from distant villages to be vaccinated, so that I was enabled to have most of the children in the Akranee Purgunna submitted to this operation. Amongst the Wurralee Bheels, when a child is attacked by small pox, it is immediately carried to the jungle, and left to its fate: it may naturally be supposed that the mortality is very great where such a barbarous custom prevails.

12. There are no distinctions of cast or sect amongst any of these Tribes: they have no Priests or Gooroos, the oldest man of each village being looked up to as the Chief of the community, and invested with a sort of patriarchal authority. At their feasts and marriages they consume a great quantity of liquor, which they distil from the Corollæ of the Mowa tree, but on general occasions they are very temperate. Robbery is almost unknown amongst the Paurias and Wurralees: I have not heard of a single case occurring amongst these Tribes since I have been in charge of the District. Affrays between the inhabitants of different villages sometimes occur, generally regarding boundary disputes. Amongst themselves, they are very hospitable: the women and children are constantly visiting from house to house, and some of the Patels informed me that they never sold any grain because their houses were always full of visitors, who consumed it all. The Wurralee Bheels, who chiefly inhabit the Katee state—a very mountainous district, extending

for about 30 miles to the west of Akranee,—grow very little corn, but have large herds of cattle: they lead quite a pastoral life, and I was delighted, on first visiting their country, to hear the choruses of the cowherds, strongly reminding me of the Rouzdes Vaches of the Tyrol: —the shrill blast of the horn in the mountains calling the cows home at night, and the women busily engaged in milking, completed the semblance. The people reside in the same hut or chalet with their cows, themselves occupying one corner of it. A Wurralee is as averse to part with his cows as is an Arab with his brood mares, but bullocks are willingly disposed of, as they have little use for them, the plough being seldom used, most of their agriculture being performed with the hand.

13. Amongst the Paurias, the women are never employed in the labour of the field; the only outdoor work they perform is collecting the Mowa flowers and charoolee nuts (chiringia sapida): they are well treated and esteemed. The marriage ceremony is never performed until both parties have arrived at maturity: the young men are generally permitted to choose for themselves, and these are perhaps the only people in Western India amongst whom love has any share in forming the marriage tie. A sum varying from forty to one hundred rupees must be paid by the youth or his parents to the father of the girl, who lays out one half of it on the brides's trousseau: if the lover be unable to pay the amount demanded, he binds himself to serve his future father-in-law during a period of eight or ten years, becoming what is termed "Ghor Jowai." During this time he resides with the family of his intended, and the parents usually permit the marriage to take place when half the period for which he has bound himself has expired. Thus daughters being a source of profit to the parents, are greatly prized, and treated with much consideration. Simple fornication between an unmarried couple is punished by a small fine, and it is not uncommon for a girl to be the mother of one or two children before her marriage. Adultery is punished by the guilty party having to pay to the injured husband the whole of his marriage expences. Polygamy is very common, and those who can afford it have 3 or 4 wives. Widows are allowed to re-marry, the parents receiving a second dowry from the husband. Marriages are only celebrated during the months of Phalgund and Waishak (March and May). The father of the youth first demands the damsel of her father: if he agrees, the price demanded is paid,—this is called Dija. The father of the youth then brings a large jar of liquor to the girl's house

and sprinkles some of it on the floor: the elder of the village is then summoned to perform Puja with the liquor, for which he receives two pice. Offerings of rice, kodra liquor &c., are then made to the deity Bawa Koomba. The following day the bride and bridegroom are covered with turmeric, and the latter goes in procession, with music and dancing, to demand his bride of her parents. She is brought out and seated near her husband. Each party is then clothed in wedding garments, and the females in attendance stand around them singing songs, of which the following will serve as two specimens:—

1st.—"Bawa Koomba Rani Kazal sago wiah
Dola doline gida gata wiah
Raout Koombee sago rod dangro
Rani Kazal sago wiah wadowna
Sarhi Choolis ponho dekhno jai wiah.

1. How beautiful is the marriage of Bawa Koomba and Rani Kazal. It is celebrated with songs and mirthful music. Raout Koomba appears like a valiant warrior. Rani Kazal appears beautiful to the beholder. Let us gaily bedeck ourselves and go to the marriage.

2nd.—Runaga dowino wiah,
Saola ranago Rani Haola indro wiah,
Yu lago Haola Rani lago bhoud,
Rani Kazal lago Babi,
Rana Koomba lages Bhai
Bohre Dougur wiah, hato dhurra wigwaree,
Rana janu wiah, bhoud lage chowur udlé cholor.

2nd. The Goddess of the Woods is about to be married—Rana Saola and Rani Haola are about to be united; she is the sister of the sylvan goddess, she is the sister-in-law of Rani Kazal, she is the sister of Raout Koomba. A marriage is being celebrated in the great mountains; anoint the happy couple with turmeric; let the sisters, as at a royal marriage, scatter the sacred powder, and waive the fan above them.

After this the bride and bridegroom are raised on the shoulders of their friends, amidst dancing and music. The bride's parents afterwards give a feast to the whole of the company, at which great quantities of liquor are drank. The whole afterwards go in procession to the house of the bridegroom, and are entertained for two days: after this the newly married couple are left together for five days. On the sixth, the bride's

father takes her home, and gives an entertainment to the whole village. Two days afterwards the bridegroom, accompanied by his friends, goes to the house of his father-in-law, and, having presented him with a jar of liquor, demands his bride, and escorts her home: the Patel of the village in which the marriage takes place, receives a fee of one rupee from the bridegroom; and of each village through which the procession passes, one anna. The Wurralee Bheels have the same customs at marriages, except that amongst them marriages take place during any month of the year, and they tie the skirts of the clothes of the young couple together as a sign that they are hereafter indivisible.

14. The Wurralees and Paurias both burn and bury their dead. Persons who have died of small pox, women dying in child-birth, and young children, are invariably buried: all the deceased person's ornaments are burnt or buried with the body. A rupee, or, if the family be very poor, a copper pice, is placed in the deceased's mouth; a little rice, turmeric, and red gulal powder, on his forehead; and his sword and bow and arrows by his side: the body is then carried with drums and music to the funeral pile; the bows and arrows are burnt with the body, but the sword and rupee become the perquisite of the mhangs or musicians. No religious ceremony takes place on the occasion. On the eighth day after the death, all the friends and relations assemble at the house of the deceased, and drink a jar of liquor to his memory. The family are not considered unclean, nor are any purifications requisite. No ceremonies whatever take place on the birth of a child: the mother is considered unclean for seven or eight days: the child is named on the fifth on twelfth day after its birth; the father and mother, or oldest member of the family, call it whatever they please: they have no names derived from gods or religion, and no second name. Bhoolia, Rattria, Mangtia, will serve as specimens of the male names, and Jutnee, Gooree, Buddee, and Chinkee, of the females.

15. The religion of these Tribes is of the most simple and primitive nature: they have no priests or temples, nor are they worshippers of idols. They have borrowed nothing from the religion and superstitions of the Hindoos, and although carpenters, blacksmiths, and other artificers, are found amongst them, they acknowledge no distinction of sects. Their form of worship is exclusively confined to the propitiation of the Superior Power by sacrifices and offerings. In the jungle near each village is a tree regarded as sacred, around which, before harvest season, the villagers assemble, and, having first prostrated themselves before the

rising sun, make offerings of corn, and sacrifice goats and fowls. This rite is performed only once a year, and it appears to be a propitiatory offering to ensure a good harvest home. The deity to whom these offerings are made is called "Bawa Koomba," and his wife is termed "Rani Kazal:" a tree sacred to her, before which sacrifices are also offered, is usually situated a short distance from the first. They also worship Waghdeo, or the Tiger Demon, but, as they simply express themselves, "only to propitiate it, and prevent it attacking our cattle, or when it has carried off any of our people." Besides the above, they have no deities or forms of worship whatever; and I doubt if any other race of people could be found so little influenced by religious prejudices or ceremonial observances. They acknowledge a Supreme Creator, who is termed Bhugwan by the Paurias, and Dihe by the Wurralees. They acknowledge no household or village deities, nor do they reverence rivers or fire. In common with most mountaineers, they are very superstitious, and implicitly believe in witchcraft and sorcery: of the former they have a great dread, and before the British rule, many old women lost their noses under the suspicion of being witches, it being a common idea that the loss of the nose destroys all power to work evil. A wizard is called Dakno, and a witch Dakin. Omens are also commonly believed in: a good omen is termed Hugun. Odd numbers are considered very lucky: seeing one black bird, called "Peechee," is regarded as a sign of great ill luck. On commencing any undertaking, omens are also cast with a bow and arrow. The mode of salutation between friends is by taking the two hands of the person saluted, and pronouncing the words "Bhaja, Bhaga."

16. A Pauria village can generally be distinguished from one inhabited by Wurralees by the superior construction of the houses and appearance of comfort. The Wurralees and their herds of cattle occupy the same house,—the Paurias usually build two neat huts of interlaced bamboos, and thatched with long grass: in one hut the family reside, in the other the cattle are kept. They are enclosed by a courtyard, on one side of which are arranged a number of circular storehouses for grain, and a shed for the earthen water vessels, which are always elevated on a bamboo frame: underneath is a wooden trough containing water for the goats and fowls. These houses are generally scattered about in small groups, each forming a small farming establishment. Mango and other trees are planted around the houses, and on the divisions between fields: they are carefully protected by bamboo trellis-work. The Pauria

peasants of these hills appear to be far more cleanly and comfortable in their dwellings than the people of the plains, and the youngest children even of either sex are never permitted to be in a state of complete nudity. The Bheels below the hills live in a very miserable manner: they remove their huts almost every year, and seldom cultivate the same field a second year. They depend more upon the produce of the forest trees than upon agriculture for their subsistence. The Wurralees and low country Bheels eat all kinds of animals except dogs, cats, and tigers; the Paurias only goats, sheep, and fowls. They all smoke tobacco, but never use opium, and very seldom hemp. All the men wear a red and white striped lungotie, of which great numbers are manufactured at Roshmal, in the Akranee Purgunnah,—they cost from two to four annas each: this, with a cloth thrown over their shoulder, usually constitutes their only dress. There are carpenters, blacksmiths, &c., amongst the Paurias and Wurralees, but no barbers or shoe-makers. Their silver and brass ornaments are made by Hindoo workmen settled at Roshmal. Each man acts as his own barber; and shoes, when worn, are brought from Kokurmoonda. Each family constructs its own agricultural implements and basket work, and thus has little need to resort to foreign craftsmen. Debt is almost unknown amongst these simple people,—doubtless owing to the lucky absence of any shopkeepers or Banians. I obtained the following account of income and expenditure from a Pauria peasant, and I insert it as I think it gives a fair example of their condition.

Production and consumption of a Pauria Peasant, of the Akranee Purgunna, with a Wife and two Children.

One plough and one pair of bullocks.

Annual Production.

Bajree,... ...4	maunds.....Rs.	4	8	0
Jowarree. ...4	do..... „	4	0	0
Ooreed... ...½	do..... „	0	8	0
Chowlee.....¾	do..... „	0	8	0
Rice.....1½	do..... „	8	0	0
Gram.....1	do..... „	4	0	0
Bhuntee... 1½	do..... „	5	0	0
Charowlee-nuts..... ... ... „		4	0	0
Mowa-flowers..... ... „		10	0	0
	Total Rupees...	40	8	0

In this, straw, grass, and kurbee, are not taken into account, as they are used for feeding the cows, bullocks, and goats.

Annual Expenses.

Grain for the family, at the rate of two maunds per mensem	Rs. 24	0	0
Government rent	„ 9	0	0
Clothes for the family	„ 4	0	0
Salt	„ 1	0	0
Tobacco	„ 0	8	0
Pepper and other spices	„ 0	8	0
Total Rupees	39	0	0

In a good year he says that he gains from fifteen to twenty rupees more than above stated; besides which he gains, by the sale of poultry, goats, calves, or bullocks, and has abundance of milk and ghee.

In money matters they reckon by "Tukkees" and "Sugganees," the Tukkee being sixteen pice, and the Sugganee two pice. They have no terms to express numbers beyond twenty: spaces of time are expressed by the term "Pidhi," signifying a generation, or the average duration of human life.

17. The Wurralees and Paurias observe three great festivals during the year. The first is Dewalli, held during the months of November and December. It lasts during two months, and is celebrated by the peasants proceeding from village to village, and dancing by torch light, and drinking mowra. The second is called Diwasa, and is held about the end of December. Four small pans of ghee are placed on the ground and a light applied to each; a little jowarree, wheat-flour, and liquor, are then added, and the house is then sprinkled with it, the assembled party singing and dancing round the lights: the next day the pans are thrown into a river. The third is the Holi, which is different from the Hindoo Holi, and somewhat resembles the ceremony of dancing round the May-pole in England. A tall bamboo pole, decked with the scarlet flowers of the phullus, strips of cloth, and a cocoanut, is erected in the centre of the village; wood, cow-dung, &c., are piled around; drops of liquor are sprinkled on it, and fowls sacrificed and thrown into the heap. At night, the whole is set fire to, the villagers dancing around and singing. On the pole falling it is cut to pieces with swords by the men: they then proceed from village to village, dancing and drinking liquor. These tribes are passionately fond of music and dancing. Their musical instruments, though rude, form a lively accompaniment to their dances: they consist of a fiddle with two strings, called "Runthee;" an instrument exactly resembling the Scotch bag-pipe, without the bag, called

" Pawlu ;" a fife made of bamboo, called " Pawi ;" a large drum, called " Mandol ;" and a small one called " Dol." Their music is neither harsh nor inharmonious, and is at least superior to any heard in the plains. It is at first plaintive and slow, gradually increasing in tone and celerity as the dancers become excited: the men and women dance together in an extended circle around the musicians,—I counted as many as fifty in one circle : some of the men carry drawn swords, which they flourish : at intervals all raise a loud shout, turning sharply round facing outwards. Their movements are not without grace, and all keep time to the music : the scene strongly reminded me of the gypsies' dances in Wallachia and Transylvania, and their music is very similar. They consume a great deal of liquor at their dances, and usually keep up their noisy merriment until morning.

18. The languages of these tribes present a great variety in the verbs and radical words : many of the vowels have such a nasal sound that it is almost impossible to express them in English correctly. The accompanying vocabularies will I think be found sufficiently copious for the object for which they are intended, namely, to enable any possible affinity that may exist between these and other aboriginal languages of India being traced. I have employed the Roman in preference to any native character, as it enables affinity with other languages being more easily traced. I need scarcely remark that these tribes have no written character ; their languages appear also to be very irregular, and governed by no grammatical rules : they have no form of the verb corresponding with the infinitive of other languages, and only two tenses, a past and present. The other tenses are formed by the addition of an irregular verb. Although it will be seen from the vocabularies that the Pauria, Wurralee, and low-country Bheels have a great many words in common, yet, owing to the difference of pronunciation and construction of the verbs, the language of one of these tribes is quite foreign to either of the others. The Wurralees always pronounce P in words in which the Paurias use B ; whilst in words derived from a foreign source, all these tribes change S into A, Sh into Hu : the grammatical construction of the Wurralee approaches more to that of the Guzerathi than either of the others.

I have the honor to be, &c.,

(Signed) C. P. RIGBY, *Lieut., Western Bheel Agent.*

(Signed) A. ELPHINSTON, *Collector and Magistrate.*

CAMP AT ROSHMAL, *29th May*, 1849.

Statistical Return of the Akranee Purgunnah.

Numbers.	Names of Villages.	Population. Males.	Females.	Total.	Revenue. Rupees.	Annas.	Number of Bullocks.	Number of Oxths or Ploughs.	Castes or Classes. Pauriás.	Wurralees.	Mullais.	Naiks.	Total.
1	Dhergaum...	32	22	54	61	0	22	11	14	40	0	0	54
2	Khootamoory	46	52	98	32	0	16	8	4	94	0	0	98
3	Katree...	25	25	50	44	0	22	11	0	50	0	0	50
4	Koondul...	20	18	38	36	0	13	6½	0	38	0	0	38
5	Hathdooe...	14	14	28	16	0	8	4	0	28	0	0	28
6	Tullie...	33	31	64	56	0	28	14	0	64	0	0	64
7	Kushgawan...	15	15	30	12	0	6	3	0	30	0	0	30
8	Moorkh Boojrook...	29	27	56	22	0	11	5½	0	56	0	0	56
9	Moorkh Khoord...	13	12	25	20	0	10	5	0	25	0	0	25
10	Ramsalla...	16	15	31	14	0	7	3½	0	31	0	0	31
11	Panwurree...	20	21	41	20	0	10	5	0	41	0	0	41
12	Kellah Khoord...	19	19	38	20	0	10	5	0	38	0	0	38
13	Kellah Boojrook...	20	22	42	31	8	15	7½	0	42	0	0	42
14	Kallee Bale...	18	16	34	20	0	10	5	0	34	0	0	34
15	Padlee...	21	22	43	26	0	13	6½	0	43	0	0	43
16	Surwanee...	27	25	52	42	0	21	10½	0	52	0	0	52
17	Wurphalla...	17	18	35	42	0	12	6	35	0	0	0	35
18	Chapree...	20	21	41	12	0	6	3	0	41	0	0	41
19	Nendulwara...	20	21	41	26	0	13	6½	0	41	0	0	41
20	Roshmal Boojrook...	81	81	162	175	0	50	25	162	0	0	0	162
21	Kharkia...	20	21	41	40	0	20	10	0	41	0	0	41
22	Jamunvai...	26	25	51	20	0	10	5	0	51	0	0	51
23	Mundwanee K...	22	20	42	12	0	6	3	0	42	0	0	42
24	Gaurai...	22	23	45	36	0	18	9	0	45	0	0	45
25	Rady Kulum...	22	22	44	38	8	14	7	22	22	0	0	44
26	Huruna Kooree...	14	15	29	28	0	8	4	29	0	0	0	29
27	Palkha...	18	16	34	31	8	9	4½	23	11	0	0	34
28	Mundwanee...	19	17	36	17	8	15	7½	22	14	0	0	36
29	Chulwara...	22	23	45	33	0	12	6	32	13	0	0	45
30	Bizlee...	15	15	30	10	0	5	2½	4	26	0	0	30
31	Paramoon...	18	20	38	32	0	16	8	0	38	0	0	38
32	Kumod's Boojrook...	12	12	34	21	0	6	3	24	0	0	0	24
33	Kumodi Khoord	14	17	31	45	0	15	7½	31	0	0	0	31
34	Munkerree Khoord...	24	27	51	6	0	3	1½	51	0	0	0	51
35	Borewan...	22	22	44	49	0	14	7	44	0	0	0	44
36	Chondwura Boojrook...	15	16	31	10	8	3	1½	31	0	0	0	31
37	Dhenojé Boojrook...	32	35	67	70	0	20	10	40	27	0	0	67
38	Dhenojé Khoord...	20	25	45	21	0	6	3	45	0	0	0	45
39	Saiekol...	40	42	82	73	8	21	10½	82	0	0	0	82
40	Bhagwura Khoord...	4	5	9	16	0	5	2½	9	0	0	0	9
41	Bhagwura Boojrook	10	12	22	7	0	2	1	22	0	0	0	22
42	Bhorud...	18	20	38	17	0	7	3½	30	0	8	0	38
43	Oomranee Boojrook...	32	34	66	63	8	19	9½	66	0	0	0	66
44	Chinal Kuwah...	20	21	41	32	8	11	5½	41	0	0	0	41
45	Sone Boojrook	20	25	45	42	0	12	6	45	0	0	0	45
46	Mundulwara...	24	26	50	64	0	32	16	48	2	0	0	50
47	Somunna...	11	12	23	14	8	5	2½	19	4	0	0	23
48	Azba...	20	21	41	31	8	9	4½	41	0	0	0	41
49	Bhozgaum...	21	25	46	38	8	11	5½	46	0	0	0	46
50	Kherdah...	24	26	50	26	0	13	6½	50	0	0	0	50
51	Munkheree Boojrook...	13	9	22	48	0	15	7½	22	0	0	0	22
52	None Khoord...	11	11	22	19	0	8	4½	12	10	0	0	22
53	Rajburdee...	18	12	30	21	0	6	3	30	0	0	0	30
54	Khanbara...	21	21	42	30	0	15	7½	2	40	0	0	42
55	Oomranee Khoord...	16	12	28	17	8	5	2½	28	0	0	0	28
56	Kussumbweer...	20	25	45	14	0	4	2	45	0	0	0	45
57	Katra...	12	15	27	7	0	2	1	27	0	0	0	27
58	Scindwanee...	20	25	45	3	8	1	¼	45	0	0	0	45
59	Kooktar...	12	15	27	26	0	10	5	27	0	0	0	27
60	Shirsanee...	30	35	65	20	8	8	4	7	58	0	0	65
	Carried forward..	1280	1317	2597	1871	0	724	326	1357	1232	8	0	2597

Numbers.	Names of Villages.	Population. Males.	Females.	Total.	Revenue. Rupees.	Annas.	Number of Bullocks.	Number of Ouths or Ploughs.	Castes or Classes. Paurias.	Wurrulees.	Mullais.	Naiks.	Total.
	Brought forward..	1280	1317	2597	1871	0	724	362	1357	1232	8	0	2597
61	Roshmal Khoord..	20	25	45	16	0	5	2¼	45	0	0	0	45
62	Hattee..	10	12	22	4	0	2	1	0	22	0	0	22
63	Makur Khoord	8	4	12	6	0	4	2	0	12	0	0	12
64	Dutel..	10	12	22	6	0	2	1	0	22	0	0	22
65	Pimpulchope..	10	12	22	4	0	0	0	0	22	0	0	22
66	Chinchkera..	12	14	26	10	0	5	2½	6	20	0	0	26
67	Tirsool	40	50	90	17	8	5	2½	90	0	0	0	90
68	Chincha..	25	30	55	32	0	16	8	0	55	0	0	55
69	Mozra..	14	15	29	10	0	5	2½	0	29	0	0	29
70	Pirnpree	14	14	28	26	0	10	5	8	20	0	0	28
71	Bhonowlee..	14	14	28	17	8	5	2½	20	8	0	0	28
72	Amlah..	40	45	85	12	8	4	2	30	55	0	0	85
73	Tuwanee..	10	12	22	24	8	7	3½	0	22	0	0	22
74	Zurelee..	10	10	20	25	0	8	4	16	4	0	0	20
75	Chikkoh..	11	13	24	17	8	5	2½	14	10	0	0	24
76	Kooklot..	12	13	25	21	0	6	3	16	9	0	0	25
77	Gendah..	30	35	65	38	8	11	5½	65	0	0	0	65
78	Bhadree..	5	5	10	3	8	0	0	0	10	0	0	10
79	Temlah..	18	18	36	13	8	6	3	4	32	0	0	36
80	Bhilgaum..	30	30	60	28	0	8	4	60	0	0	0	60
81	Sadree	12	12	24	17	8	5	2½	24	0	0	0	24
82	Khoosé..	25	25	50	28	0	8	4	50	0	0	0	50
83	Wurwalee..	10	10	20	10	8	3	1½	20	0	0	0	20
84	Mall..	20	20	40	28	0	8	4	40	0	0	0	40
85	Nangaum Boojrook..	25	25	50	14	0	4	2	50	0	0	0	50
86	Vavee..	25	25	50	10	0	5	2½	0	50	0	0	50
87	Phulkuree..	8	8	16	7	0	2	1	16	0	0	0	16
88	Hurung..	12	12	24	12	0	6	3	0	0	24	0	24
89	Chandwura K..	7	7	14	7	0	2	1	10	4	0	0	14
90	Amree..	3	3	6	3	8	1	½	0	0	6	0	6
91	Gorarree..	10	8	18	4	0	4	2	0	18	0	0	18
92	Akwanee..	10	8	18	4	0	3	1½	0	18	0	0	18
93	Boreechincha..	7	8	15	4	0	2	1	0	15	0	0	15
94	Kakurpattee..	25	20	45	18	0	9	4½	0	45	0	0	45
95	Padulpoor..	15	16	31	7	8	0	0	0	31	0	0	31
96	Aslee..	60	70	130	10	0	0	0	0	130	0	0	130
97	Rapapoor..	3	3	6	6	0	0	0	0	6	0	0	6
98	Ashwuddhama..	10	10	20	3	0	0	0	0	20	0	0	20
99	Chougaum..	12	12	24	6	0	0	0	0	24	0	0	24
100	Chandsilee..	9	9	18	4	0	0	0	0	18	0	0	18
101	Kuttorah..	12	11	23	28	8	8	4	8	15	0	0	23
102	Amonee..	15	15	30	6	0	4	2	0	0	0	30	30
103	Nougaum Khoord..	15	15	30	3	0	0	0	0	0	0	30	30
104	Mendwanee Boojrook..	6	8	14	39	0	6	3	14	0	0	0	14
105	Domkhullee..	14	14	28	12	0	6	3	0	0	28	0	28
106	Chippul..	3	3	6	9	8	4	2	2	4	0	0	6
107	Kottar..	16	16	32	4	0	9	4½	8	0	0	24	32
108	Barree..	5	5	10	10	8	3	1½	10	0	0	0	10
109	Wurkharee..	18	18	36	20	0	10	5	0	36	0	0	36
110	Silgedah..	10	10	20	3	0	2	1	0	0	20	0	20
111	Kerwar	10	10	20	17	8	2	1	20	0	0	0	20
112	Pimpulwara..	5	5	10	4	0	0	0	0	10	0	0	10
113	Lukkurkot..	30	30	60	3	0	5	2½	0	0	0	60	60
114	Rancepoor..	70	80	150	3	0	40	20	0	0	0	150	150
115	Mandvee Khoord..	7	7	14	18	0	5	2½	14	0	0	0	14
116	Zellolah..	7	7	14	8	0	4	2	0	0	14	0	14
117	Oorda..	5	5	10	7	0	2	1	10	0	0	0	10
118	Khurkulla..	5	5	10	3	8	1	½	10	0	0	0	10
119	Salekhuree..	4	4	8	3	8	1	½	8	0	0	0	8
	Total.....	2188	2279	4467	2611	0	1012	506	2045	2028	100	294	4467

Camp Roshmal,
29th *May*, 1849.

(Signed) C. P. Rigby, *Lieut., Western Bheel Agent.*
(Signed) A. Elphinston, *Collector and Magistrate.*

Vocabulary of the Languages of the Paurias, Wurralees, and Low-country Bheels, inhabiting the Akranee Purgunnah and adjoining Districts in the Sathpoora Mountains.

Adjectives and Attributives.

English.	Pauria.	Wurralee.	Infra Sathpoora Bheels.
Good	Haro	Hango	Hago
Bad	Neyaro	Nohongo	Naharo
True	Hago, khoro	Khurro	Khurro
False	Jhutho	Jhutho	Jhutho
Brave	Sur	Jurokhu	Murdanee
Cruel	Mollo	Bullakhu	Benkiyalo
Hungry	Bhuklo	Phukhe	Bhuk lagó
Thirsty	Turso	Tihidiyu	Tihis lagé
Naked	Nangu	Nagru	Nagro
Alive	Jewto	Jewtu	Jewto
Dead	Moilo	Moigo	Marigiyo
Asleep	Hingo	Hingyo	Hinri
Awake	Jagiyo	Jagiyo	Jagto
Old	Daya	Doho	Doho
Young	Nown	Nowha	Juan
Healthy	Hoklo	Kumbee	Kuchi
Sick	Mando	Mandlo	Dukhi
Strong	Tazu	Jhadu	Jhado
Weak	Nublo	Rinjal	Kirkurailo
Tall	Ucho	Uchu	Ucho
Fat	Sumrot	Delachu	Wahalo
Thin	Patlo	Patlu	Kirkalo
Tired	Aari gyo	Thakiyu	Thaki giyo
Lame	Lungro	Panglo	Lungro
Blind	Andhlo	Andhlu	Jhajlo
Deaf	Bayro	Bayru	Boro
Dumb	Mukko	Mukko	Muklo
Alone	Ekli	Eklu	Eklo
Poor	Nublo	Nublu	Ghurrub
Rich	Matel	Malwalo	Nanto panto
Drunken	Mutwalo	Jhakiyo	Tolbi
Dirty	Mullo	Mailu	Kitailo
Clean	Ujlo	Ujlo	Ujlo
Old (not new)	Junlo	Juno	Juno
New	Nowlo	Nowo	Nowo
Present	Hajur	Woojur	Hajur
Absent	Nachutlo	Ujree	Najur
Ready	Tiyaro	Tiyar	Tiyar
Prosperous	Hajo	Hajo	Hajo
Valuable	Jhubro molo	Wurra muke	Jhaku
Worthless	Nojurio	Nojuro	Konumol
Easy	Hopo	Arro	Supa
Difficult	Hukkut	Koido	Agro
Lucky	Hajo nuseeb	Kurmwalo	Kurmwalo
Unlucky	Nublo	Nublo	Nublo
Cheap	Susto	Susto	Susto
Dear	Mungo	Mogo	Mogo

Adjectives and Attributives.—(Continued.)

English.	Pauria.	Wurralee.	Infra Sathpoora Bheels.
Pure	Hope	Helo	Poholo
Impure	Mullo	Dowlo	Kitalo
Wholesome	Hajlo	Hajlo	Hajo
Edible	Khaneo	Khano	Khota
Blunt	Mal'li	Mullu	Doro
Dark	Andharu	Andhar	Andharo
Sharp edged	Tikho	Wadhi	Tikho
Cultivated	Waolo	Woilo	Khet kherda
Uncultivated	Ujro	Ujro	Ulliyo
Muddy	Guddol	Gundiyo	Dowlo
Saline	Kharo	Kharo	Kharo
Fresh	Hajo	Helo	Chukko
Still	Hokut	Hokut	Watru
Deep	Undo	Undo	Undo
Shallow	Utlo	Nindo	Nindo
Cold	Helo	Helo	Helo
Hot	Tal'to	Unho	Unho
Cloudy	Wadlo	Wadlo	Wadlo
Rainy	Jhoree	Wurhat	Wurhat
Wet	Bijlo	Bingiyo	Pijago
Dry	Huklo	Huga	Hukago
Red	Ratha	Ratho	Ratho
White	Ujlo	Ujlo	Pando
Blue	Telyo	Telyo	Nilo
Black	Kalo	Kalo	Kalo
Green	Nilo	Nilo	Nilo
Yellow	Pilo	Pilo	Puolo
Ripe	Pako	Paké	Pakehi
Raw	Kacho	Kacha	Nikhe
Rotten	Gundeyo	Undiyo	Kidalo
Sound	Aito	Hagiyo	Basli
Stinking	Gundai	Gundiyo	Gudai
Rough	Khurburiyo	Kharburra	Khurbo
Smooth	Hualo	Hualo	Chikno
Hard	Watro	Watro	Watro
Soft	Wallo	Walloyé	Moyo
Straight	Dewlo	Padro	Padro
Crooked	Dungal	Wakriyo	Wakro
Full	Borel	Poilo	Purayo
Empty	Talo	Tallo	Také
Hollow	Takiyo	Tallo	Tallo
Heavy	Jhubbro	Jhabbo	Khobarri
Light	Thalo	Hulko	Nahano
Great	Moto	Motiyo	Moto
Small	Aito	Aitio	Tuko
Long	Lambo	Lambo	Lambo
Short	Nicho	Nicho	Aitho
High	Aicho	Ucho	Ucho
Low	Nano	Nano	Nicho
Round	Gond	Gungra	Boda
Square	Cho koni	Char kunjra	Char kona
Open	Ugaro	Ujlo	Ugré
Shut	Dakidé	Jhah	Bujhide

Adjectives and Attributives.—(Continued.)

English.	Pauria.	Wurralee.	Infra Sathpoora Bheels.
North	Bhagono	Phal	Malwa
South	Dukkun	Dehen	Dukno
East	Ugono	Dinkta	Dihuge
West	Burono	Diburya	Dih buge
The present time	Yetal	Etal	Bokhut
The past	Agadi	Agarri	Agadi
Windy weather	Wako	Waruyu	Waroyo
Stormy	Waiduyo	Putyu	Wedi
Sandy	Welta	Welto	Reto
Married	Wiyayo	Wiya walo	Wurrar wiyo
Single	Eklo	Eklo	Eklo
Deserted	Ujar	Ujaro	Ujri
Industrious	Kusbi	Wahto kai	Kamoho
Idle	Hujgiyu	Aliho	Ali
Passionate	Kotru	Khatru	Rogaro
Mad	Gandu	Gandu	Gandwalo
Lame	Wakru	Panglu	Lungra

Names of Kindred, &c.

A man	Mati	Mali	Moho
A woman	Bairi	Bairi	Teh
An infant	Paro. m.	Choru	Poiti
A young girl	Nandree	Ajli	Poiti
A boy	Chora	Poiro	Jheto
A bride	Nawri	Odli	Odli
A bridegroom	Nurrao	Or	Orlo
A husband	Lado	Lado	Tho mati
A wife	Ladi	Baior	Thé
A widow	Rundol	Rundol	Rundel
Widower	Randka	Rundol mali	Rondohe
Virgin	Awti chori	Kuwari	Kuwari
Whore	Chinal	Chinal	Chinal
Corpse	Moile	Moime	Moigo
Heir	Warus	Maldhunnee	Warus
Ancestor	Jhurilo	Jhudla	Warawari
Father	Bundha	Bapa	Ba
Mother	Ma	Aiya	Yaha
Sister	Bonu	Bai	Bhoi
Son	Chora	Cho	Poiro
Daughter	Chori	Choi	Poiri
Grandfather, pat.	Gohira	Ajlo	Dole baké
Grandmother, pat.	Moli ma	Yehya	Dole yaké
Grandfather, mat.	Ajlo	Babo	Dole baké
Grandmother, mat.	Aiya	Aji	Dole yaké
Son-in-law	Juwailo	Juwahi	Juwai
Father-in-law	Sasro	Mamo	Aharo
Mother-in-law	Hao	Phin	Phin
Daughter-in-law	Waori	Waori	Waori
Uncle	Kako	Kako	Kaka
Aunt	Kakee	Kakee	Kakee
Cousin	Kako chora	Kaka poiro	Kaka poiro
Neighbour	Ghurobo	Bhai bundia	Ghuroba

Names of Kindred, &c.—(Continued.)

English.	Pauria.	Wurralee.	Infra Sathpoora Bheels.
Friend	Bhai bundo	Hogai	Bhai bundal
Enemy	Buddo	Diggo	Shutru
Stranger	Porai	Porayo	Bin wulkiyo
Ploughman	Pawur	Pawur	Awtiyo
Cowherd	Guwar	Gowhal	Guwar
Servant	Allee	Allee	Horiho
	Names of Time.		
Time	Wela	Tar	Bokud
Day	Dihi	Dihi	Dihi
Night	Rat	Rat	Wat
Morning	Hundaree	Dihugo	Hukapor
Noon	Matha Dihi	Magun	Mazun
Sunrise	Dihi uge	Saj	Dihi ugigo
Sunset	Haj	Dihi buryo	Dihi gyo
An hour	Tal	Taldoma	Ghodee
A day	Dihi	Ek dihi	Dihi
A week	Athwo	Athe	Alh dihi
A month	Mahino	Mahino	Mahino
A year	Wurri	Wurri	Wihiri
Sunday	Ditwar	Ditwar	Ditwar
Monday	Homwar	Homwar	Homwar
Tuesday	Mongolwar	Mongolwar	Mongolwar
Wednesday	Boodhwar	Boodhwar	Boodhwar
Thursday	Biturwar	Wisturwar	Biturwar
Friday	Hookurwar	Hookurwar	Shukurwar
Saturday	Shawar	Shawur	Shenwar
January	Utran	Utran	Utran
February	Danda singa	Gind	Danhi
March	Holi	Holi	Holi
April	Koliatum	Kaliatum	Guriparwo
May	Akutree	Dalholi	Akutri
June	Dalwalo	Akutree	Jhete
July	Bhoodbawa	Boodhbhot	Akhar
August	Rakhi	Diwadhun	Hurawun
September	Killia	Kedli	Badwo
October	Dehra diwalli	Dehoro	Dehero
November	Katik	Katik	Diwali
December	Purpo	Poho	Hulug diwali
To-morrow	Hukal	Hondeh	Hukal
Yesterday	Kal	Dihgoilo	Kal
Now	Yew	Hintal	Aje
	Nouns—Substantives.		
A bow	Gulwul	Dhunlee	Toh, kuhu
An arrow	Bilko	Bilkee	Hor, kandee
A sword	Turwar	Turwar	Turwar
A gun	Bunduck	Bundkee	Bunduk
A plough	Ol	Ol	Walli
Powder	Daru	Daro	Dharu
Shot	Chororo	Gurhi	Hunapurra
A spear	Bhalo	Bhala	Bhalo
Battle	Lorta	Jhulta	Jhulata
Pillage	Lute	Luli	Lutche
Murder	Khun	Khuni	Muhimayo
Theft	Chorun	Chor	Bandah

Nouns—Substantives.—(Continued.)

English.	Pauria.	Wurralee.	Infra Sathpoora Bheels.
Boundary	Hiw	Hiw	Hiw
Language	Wat	Wat	Wat
A field	Khuttor	Khet	Khet
Spade	Pauro	Dati	Pawra
Hoe	Kudalo	Kundali	Kudalo
Rake	Kuhulo	Kuhu	Kuha
Sickle	Datlo	Datlo	Datlo
Harrow	Welti	Kedhu	Wilti
Sack	Mussutte	Kol	Kol
A farm	Gutlo	Kotu	Koto
Money	Mal	Mal	Mal
Grass	Khod	Khod	Khod
Straw	Baro	Purral	Pullo
Milk	Dudh	Dudh	Dudh
Eggs	Inda	Inde	Hullawe
A cock	Kukra	Kukra	Kukra
A hen	Kukri	Kukri	Kukri
A goat	Bokra	Bokro	Bokro
A bullock	Bail	Buldeo	Boyel
A cow	Gai	Gai	Gai
A horse	Ghuro	Ghoda	Khoda
A calf	Wasro	Wasro	Wasro
A cat	Billari	Billari	Billari
A dog	Kutro	Huno	Huno
A snake	Hap	Hap	Hap
A scorpion	Wochi	Wichi	Wichihi
Bedstead	Katto	Katlo	Walliyo
Earthen vessel	Hundro	Handlo	Handlo
Wooden vessel	Pualo	Atryo	Adali
Iron	Ludo	Lodo	Lodo
Stone	Dhugro	Dhugro	Dhugro
Silver	Rupo	Rupo	Rupo
Copper	Tambo	Tambo	Tambo
A box	Hunduk	Dhabro	Peti
A seer	Aer	Her	Her
A maund	Mow	Mon	Mun
A span	Wit	Bet	Bet
A weight	Tol	Takree	Tolia
A measure	Gunniyo	Gunno	Gonchi
Debt	Rin	Kurz	Kurz
Loan	Udhar	Udhar	Udharo
Interest	Wiaz	Wiaz	Wiaz
Water	Pahi	Pahi	Pahi
A river	Noddi	Karhi	Karhi
A hill	Dungur	Bodo	Dungo
A tank	Tullao	Tullao	Tullao
A well	Wer	Wer	Wihi
Wind	Waro	Waro	Waro
Storm	Waddul	Waddo	Waddul
Rain	Wurhat	Wurhat	Wurhat
Thunder	Gaje	Gajehe	Goje
Lightning	Wij	Wijlee	Wijlee
Hail	Garo	Garhe	Garhia
Ice	Him	Him	Him

Nouns—Substantives.—(Continued.)

English.	Pauria.	Wurralee.	Infra Sathpoora Bheels.
Mist or Fog	Duaro	Duker	Duhero
Fire	Agti	Ag	Ag
Smoke	Pinu	Pihu	Pihe
Wood	Lukur	Lakro	Lakre
Cowdung	Chan	Chan	Sahar
Straw	Pulo	Purao	Pulo
Grass	Khod	Khor	Khod
A spring	Kuwo	Kuwa	Kuwa
A well	Wer	Wer	Wihi
A forest	Ran	Wagro	Char, he
A tree	Jhar	Jhar	Jhar
	The Human Body.		
The human body	Dillo	Dilla	Dil
The head	Mund	Nidal	Mundko
The skin	Katro	Chamro	Chamro
The hair	Kehi	Kehi	Kehi
Nose	Nak	Nak	Nak
Eyes	Dolo	Dola	Dole
Mouth	Moyi	Moyi	Sobri
Ears	Kan	Kan	Kan
Teeth	Dant	Dant	Dant
Neck	Boch	Bochi	Bochi
Arm	Kawa	Kawo	Baoli
Chest (male)	Dipli	Pipli	Madil
Hand	Hath	Aath	Hath
Back	Waho	Bordu	Bordo
Foot	Pai	Pag	Pag
Toe	Angto	Angto	Akro
Finger	Angtia	Angi	Akriga
Blood	Luhi	Rughot	Roghut
Tongue	Jibh	Jibh	Jibh
Beard	Chuddhi	Kuchri	Darhi
Moustache	Mus	Much	Machi
Breast (female)	Chatee	Chatee	Chatee
Nipple	Dai	Buni	Bugelo
The womb	Potsat	Gabh	Ugihi
Heart	Digdig	Dugdug	Dugdug
Liver	Kalij	Kaij	Kaij
Brain	Tal	Tal	Talu
God	Bhugwan	Purmeshor	Bhugwan
Heaven	Horog	Horog	Hurug
Hell	Itol	Chumarkund	Murug
The world	Mullock	Dunya	Sela mumvi
Light	Ujre	Ujro	Ujalo
Darkness	Andhar	Andharo	Andharee
The devil	Bhut	Putru	Patro
Ghost	Maware	Muyado	Mahanyo
Sun	Dih	Dih	Hurig
Moon	Chand	Chand	Chand
Wizard	Dakon	Dakno	Dakno
Witch	Dakun	Dakun	Dakin
Moonlight	Junno	Junni	Joni
Sunshine	Top	Top	Top

Ornaments.

English.	Pauria.	Wurralee.	Infra Sathpoora Bheels.
An ornament	Gahinu	Gurno	Gono
A mirror	Arho	Arhu	Arso
A bracelet	Kakno	Wala	Kaknia
An armlet	Awli	Boitia	Wele
An anklet	Tudu	Walo	Todo
A ring	Mudi	Mundi	Mudi
An earring	Mudiyo	Mundi	Bati
A nose-ring	Wali	Nuth	Nuthlo
A necklace	Kidiya	Kidi	Ahni
A silver chain	Saklo	Auklu	Hukul

Names of Animals.

A horse	Ghudo	Khodo	Khodo
A mare	Ghudi	Khodi	Kodi
A cow	Gai	Gai	Dai
A bull	Bail	Buldeo	Boyel
A dog	Kutro	Huno	Huno
A goat	Bokra	Bokro	Bokra
A cat	Billari	Billari	Billari
A rat	Undro	Undihi	Undi
A tiger	Wagho	Wagh	Wagh
A leopard	Chitu	Chito	Chito
A bear	Richro	Richro	Asal
A jackal	Koilo	Kolu	Kolo
A wolf	Landgo	Landgo	Landgo
A hyena	Turus	Turso	Turso
A fox	Balti	Balti	Lomro
A civet	Sunkhur	Pingraru	Kiri
A fish	Maso	Maso	Macho
A wild hog	Ranhur	Ranhur	Ranhur
A calf	Wasri	Wachru	Wasro
A buffalo, male	Paro	Pado	Pado
A buffalo, female	Pari	Padi	Moho
Bison	Ran paro	Ran pado	Gohaojee
Sambre	Humbur	Humber	Humber
Antelope	Gutal	Pamiyo	Phakro

Articles of food, &c.

Honey	Moh	Mud	Modh
Bees'-wax	Mem	Men	Mi
Rice	Chuka	Choka	Tandul
Wheat	Goh	Gou	Gou
Gram	Chunna	Chenna	Chana
Jowaree	Jowar	Jowar	Jowar
Bajree	Bajree	Bajree	Bajro
Ooreed	Ooreed	Ooreed	Ooreed
Onions	Duglee	Kando	Kando
Salt	Mito	Mit	Kharo
Red pepper	Miri	Mircho	Mirchio
Tobacco	Bhang	Pang	Pang
Sugar	Helekur	Hukkur	Hukkur
Ghee	Chupur	Chuper	Kih
Mutton	Maha	Maha	Maha
Beef	Gomaha	Bodo maha	Mota maha
Bread	Roto	Roto	Mando
Indian Corn	Mukkia	Doda	Dodra

Articles of food, &c.—(Continued.)

English.	Pauria.	Wurralee.	Infra Sathpoora Bheels.
Liquor	Haro	Horu	Haro
Cocoanut	Narel	Norel	Narelo
Turmeric	Oleed	Huldi	Hulud
Garlic	Lohon	Lohon	Loho
Ginger	Awhdo	Anhdo	Alo
Brinjal	Ringna	Ringne	Wengo
Sweet Potatoe	Mula	Rutalee	Ratali
	Diseases.		
Fever	Hore	Tup	Boro
Headache	Muncherryo	Muncherey	Mundko dukhi
Diarrhœa	Burtee	Burtee	Bat
Ashthma	Dum	Dum	Aungiye
Ophthalmia	Doloaiya	Dala ayia	Dolo alo
Itch	Khurjo	Khurjo	Khuroj
Leprosy	Motoduk	Wir kilyo maha	Kharelagi
Small pox	Matha	Matha	Mathadewi
Syphilis	Gormi	Gormi	Gojrehe
Cholera	Murrai	Wighru	Murrki
A wound	Jhatko	Rondi	Dhama
	Indeclinable Words.		
Above	Per	Uche	Upe
Beneath	Bui	Niche	Puitawe
Behind	Wat buchko	Paimaro	Pacheri
Before	Homo	Agade	Agla
Within	Bormi	Por	Mathepori
Without	Phake	Bigur	Bugor
Near	Hahano	Hohano	Uge
Far	Chetto	Chetto	Duhu
Here	Hura	Hom	Yehi
There	Pelo poro	Pohomo	Palo
Everywhere	Korar	Erjage	Kai bijoho
Nowhere	Hoina	Kaina	Kai bi naha
On this side	Urwalo	Owliwalo	Yehai
On that side	Purwalo	Pahiliwalo	Yeplo
Towards	Ya luggu	Pulgu	Pulgu
Together	Millin	Miltun	Millina
Separately	Juda	Judu	Judo
Yes	Oh	Ha	Ha
No	Na	Na	Na
Why	Kaha	Kaha	Kai
How much	Kotrak	Ketok	Kote
How many	Keta	Ketak	Keta
Too much	Gunno	Waru	Bhari
Too little	Thoro	Thoro	Kubi
How	Koilo	Kohak	Tado
Perhaps	Kewik	Pun	Kendo
Enough	Puro	Puro	Kedi
Little	Thoro	Thoro	Thore
Much	Wulto	Jajo	Jhako
Less	Komi	Komi	Komi
More	Hoto	Wuttu	Watho
Because	Kahara	Kahara	Kaha
If	Jor	Jor	Kedi

Indeclinable Words.—(Continued.)

English.	Pauria.	Wurralee	Infra Sathpoora Bheels.
And	You	Han	Ai
But	Mabo	Mob	Pun
Again	Olta	Wulto	Pacho
I	Me	Me	Ai
Thou	Yu	Yu	Tu
He	Chu	Toho	To
She	Chi	Tihi	Peli
We	Amho	Amhoho	Amhu
Ye	Tumho	Tumhoho	Tumhu
They	Palu	Te	Topliyo
Mine	Maro	Maho	Ma
Thine	Taro	Tehaho	Ta
His	Chese	Tiyahoe	Tuja
Ours	Apno	Ma	Apo
Yours	Tumro	Tiyahu	Towo
Theirs	Cheche	Tero	Tiya
Self	Hiju	Anji	Huden
All	Ghunna	Budda	Huggo
Own	Miyé	Moiye	Maha ai
This man	He mali	Yomati	Hurro maho
That man	Pelo mali	Pullo moti	Tomaho
Any	Kat	Kaira	Kai
Nobody	Koi na	Kai bina	Hedo bina
Anything	Komche	Kaijins	Kaijins
		Verbs.	
To do	Kurro	Kowe	Kuho
To be	Raiyo	Rowe	Rehu
To make	Kurro	Kohawe	Kehu
To live	Raiyo	Indirowe	Rihu
To die	Murro	Murrowe	Moiyo
To sleep	Nindlo	Huwé	Hirere
To awake	Jagto	Jagwe	Jago
To drink	Pino	Pewe	Piye
To eat	Khane	Khahuwe	Kho
To run	Dhadhio	Ghugdewe	Ghugde
To strike	Marro	Marriyawe	Welo
To fall	Purriyo	Purgiyowe	Pode
To bite	Chawno	Chawiho	Chawehe
To kick	Laddi	Latiawe	Latkide
To kill	Marro	Moi take	Moi take
To shoot	Bunduk marro	Bunduk jharo	Windhi mahe
To see	Ballo	Palehewe	Here
		Verbs active and intransitive.	
To read	Wachtino	Wachtano	Waihe
To write	Lekhareno	Lekhere	Lekhe
To learn	Tewailo	Hikaiyo	Wikhe
To forget	Wihiriyo	Wihirut	Wiragiyo
To teach	Shikhawane	Aikhore	Hikwehe
To revenge	Khun bande	Khun lehe	Dawo lewo
To please	Hajoeno	Khus hoe	Khuchi rujje
To be angry	Khotaine	Khota wiyo	Rogaro
To stop	Ubrone	Thamboye	Ubhire

Verbs active and intransitive.—(Continued.)

English.	Pauria.	Wurralee.	Infra Sathpoora Bheels.
To ride	Chorjano	Churigo	Churego
To plough	Helno	Kherta	Kherne
To sow corn	Waono	Petlure	Pawro
To shout out	Hak dehe	Hohore	Hak dehe
To tell a lie	Jhuto bullo	Nande mele	Lubbadi kehe
To be able	Hekto	Kuwu tue	Akhte
To bury	Dahno	Dati delo	Dati pe
To burn	Baldeno	Bali delo	Luggaripe
To beat	Detleheno	Mayuhe	Takene
To marry	Wiah kurno	Wewahut	Wurrarwiyo
To dance	Nachno	Nachlo	Nachele
To sing	Gawno	Gidh gawe	Git akhe
To play music	Wujano	Geyja guggare	Wajwo
To cultivate	Khet kurno	Khet kohihe	Khet kurre
To laugh	Ahane	Hoilo	Wahe
To cry	Rorno	Rowagya	Rode
To kiss	Bubadalno	Bobru ledo	Gu api
To quarrel	Jhulno	Randiwalo	Radlo
To answer	Jepapno	Jebabne	Jab dewo
To ask	Lahweno	Mangigo	Mangiyo
To help	Aktit lawno	Aktit lagare	Asro
To hear	Hobulno	Hunaine	Huno
To steal	Churno	Wichitlo	Choro
To sell	Wichno	Wichune	Wicheche
To cheat	Khotaino	Rankhuwe	Duggo deho
To reap	Nonno	Walluwe	Katche
To swim	Jheputno	Toragyo	Toro
		Numerals.	
One	Ek	Ek	Ek
Two	Due	Ben	Ben
Three	Tin	Tin	Tin
Four	Char	Char	Char
Five	Panch	Panch	Panch
Six	Cho	Cho	Cho
Seven	Hat	Hat	Hat
Eight	Ath	Ath	Ath
Nine	No	No	No
Ten	Dah	Dah	Do
Eleven	Agiar	Agiar	Egiar
Twelve	Bar	Bar	Bar
Thirteen	Ter	Ter	Ter
Fourteen	Choud	Choud	Choud
Fifteen	Punor	Punor	Pundra
Sixteen	Hol	Hol	Sola
Seventeen	Huttur	Huttur	Suttro
Eighteen	Addhar	Addhar	Attaro
Nineteen	Agni	Agni	Unis
Twenty	Wihi	Wihi	Wihi
Fifty	Dai wihi dah	Ben wihi dah	Ben wihi do
Eighty	Char wihi	Char wihi	Char wihi
One hundred	Panch wihi	Panch wihi	Ek ho
Once	Ekda	Ekda	Ekda
Twice	Dueda	Benda	Benda
Thrice	Tihida	Tinda	Tenphera
Four times	Char phera	Charda	Charphera

Numerals.—(Continued.)

English.	Pauria.	Wurralee.	Infra Sathpoora Bheels.
Ten times	Dah phera	Dahda	Dophera
First	Pahilo	Pehlo	Pahilo
Second	Dohoro	Dohiro	Bihiro
Third	Tihro	Tihro	Tehiro
Fourth	Char koita	Charo	Chouto
Fifth	Panchwo	Panchwo	Panchwo
Sixth	Choto	Chetto	Chetto
Seventh	Hutwa	Hutwo	Hutto
Eighth	Athwa	Athe	Athwo
Ninth	Nowo	Nowe	Nowo
Tenth	Dahwo	Dohe	Dohwo
Eleventh	Agiarwo	Agiarre	Egiarwo
Twelfth	Barwo	Barre	Barwo
Twentieth	Terwo	Tere	Terwo

Miscellaneous.

Flour	Lut	Lot	Lot
Oil	Tel	Tel	Tel
Money	Paiha	Pachu	Paiso
Fruit	Phul	Phola	Phullo
A road	Wat	Wat	Wat
Jungle	Dungur	Rana	Ran
Clothes	Lugro	Dhako	Pothro
Shoes	Kahara	Kahare	Hahare
Stars	Tara	Tara	Chandia
Fire	Agti	Pullu	Ag
Earth	Durte	Kadho	Puhi
An eclipse	Gorun	Gorun	Mondlo
A blacksmith	Luhar	Lohar	Nar
A carpenter	Hutar	Sutar	Hutar
A young married woman	Babee	Babee	Babee
A parrot	Nokto	Nokta	Hunno
A crow	Kaglo	Kagro	Kagro
A mango tree	Ambo	Amba	Ambo
A gourd	Doilo	Tumri	Tumri
A bamboo	Tokur	Wahon	Waha
A cocoanut tree	Norel jhar	Narol jhar	Narel jhar
Brab palm	Tar	Para	Tar
Tamarind tree	Cheech	Ambli	Ambli
Ficus indica	Wor	Wor	Wur
Ficus religiosa	Piplo	Pipul	Pipul
A bee	Mohun Makha	Paoro makhi	Mudh makhiyo
A flee	Pihli	Pihiwe	Daha
A spider	Makri	Makri	Pihwo
Cotton	Kupas	Kopaha	Kupas
Cotton plant	Kupas	Kopaha	Kupas jhar
Charcoal	Koila	Koilu	Kohlaha
A feast	Pungot	Khaot	Khaha
A frog	Detka	Deduk	Dedko
Rainy season	Kurwan	Jheturi	Wurrat wehe
Hot season	Unhalo	Unhalo	Unhalo
Cold season	Hiyalo	Hiyalo	Hiyalo
A feather	Piche	Pise	Pis
A bone	Had	Had	Hadko

English.	Pauria.	Wurralee.	Infra Sathpoora Bheels.
Where do you come from?	Tum kahandok aie?	Kaha tok awe he?	Kai deké alo?
Where are you going?	Tum kaha jata?	Tum kaha jata ha?	Kaha jata ho?
What do you want?	Tumo kai wihe?	Tumho kehe woh?	Tu kai mago?
I have brought a petition.	Amho ek wato liye.	Amhé yek ghot let awe he.	Amho ek arzi dalo.
Can you read or write?	Tumo purht lekta awlohe?	Tumho lekta purhta awre he?	Tun wacha likha awehe?
How many children have you?	Tumra kotra chora hoe?	Taha kete chohe he?	Tun kote poire he?
Come to me to-morrow morning.	Andhare mehe pa awje.	Kal wege maha paha awje.	Mote wege amha hai awje.
I cannot go there to-day.	Amhochai jai na hukke.	Hewulle na jatohe.	Aj ai na jato.
Who is the Patel of your village?	Tumro gaonna Patel kon che?	Tuma gawa Patela kodu he?	To gaon waho kedo he?
See if he is at home.	Dekko ghorma chi kaihe.	Ya kome to hoe ka?	Kome waho ahi ki na?
What is your name?	Taro nao kai he?	Taro nao ka?	To nao kai?
Has your child had small pox?	Tumro choraho matha nikli?	Ta cho hiya matha nikle ha?	To poiro dewi kadi?
Bring it to me this evening.	Sanjo mehe pale aw.	Aj mahe choha maha lawje.	Aje wate wilé amhe leawje.
Why did you strike him?	Ine kai kame mari?	Tui kai kame kutiyo?	Tyan ka tokiyo?
Will you sell this?	Tum ihi wechta?	Tui hehe wechiye?	Tu you wechehe?
What is the price of it?	Ero molo kai?	Yaha koto mol he?	Ya mol kai?
When did your father die?	Tumro ba kaha moilo?	Taha abu kidhi moiyo?	To ba koke dihi mygyo?
Whose cows are these?	Yihi gai koni chetohe?	Yihi gaya koda hoy?	He gauro kide he?
I want some water, I am thirsty.	Amhe tehe lage, thoro pahi lawo.	Moho payi joé, tihi lagi.	Amhe papi lagi thoro pahi dawe.
Is your daughter married?	Tari chori wiya wiho?	Ta chohi wiya ohive?	To poiro wurrar wihyo?
Who killed this man?	He mati kone mari?	Ye mati kodo mayhe?	He moho kedo mayo?
He shot him with bow and arrow.	Inne dunlo bilko purri mariyo.	Tiha windi mayho.	Toha toha kand wai mayo.
He killed him with a sword.	Inne torwar kurri ghutko mariyo.	Tiha unni chul kawi mayho.	Tiha yeplo turwariyo mayo.
You must take some medicine.	Tumo sal leno aweyo.	Tumo thoro ohod jojo.	Tum ohod leje.
He stole a goat from me.	Inne amro bokro choriyo.	Umha bokri toho chori ledo.	Toho edeke bokro choho legyo.
Bring a rope and tie his hands.	Ek daro lo, hath bandho.	Ek dori lawe letra hathi bandiya.	Doro dawe eplo hith bandhe.
How much did your marriage cost?	Tumro wiya ketro tukka lagi?	Tuma wiya kotro tukkiyo lagiyo.	Tuwo wurrar koto khureh uryo.
Grind this bajree.	Hehe bajra dulno.	Hihi bajree doha.	He bajree dohé.
This is very rich land.	Hehe bhui hago che.	Hihi jago bhari haji he?	He torti bhari hari he.
Can you play, dance, and sing?	Tumro wajarta nachta awre?	Toho wajarta nachto gaota awre he?	Tum wajta nachta gita aweche?
His house was burnt.	Hero ghor bul gyo.	Ta ko bulli gyo.	Tya ko bulli giyo.
You are very dirty.	Tu ghunno mullo he.	Tu bhari mullo he.	In bhari mullo he.
Bring some fresh water here.	Hehe thoro hayo pani la.	Toho hajlo payé le awje.	Helo pahi leawe.
Did you see the tiger?	Tum wagh dekhlo?	Pullu waghé tu dekhiyu?	Tuyo wagh dekhiyo?
Shew it to me.	Amho dek hare.	Maho to dekhar.	Mun dekhawe.
Where do you live?	Tum kaha rehta?	Tumo kaha rotin ha?	Tu kai reheto?
I am building a house.	Me ek ghor band he.	Am ko bandhtelo.	Ai ek ko bandho.
I am going to fish.	Me masa marul jata.	Am mase maha jatlo.	Ai machi mara jato.
A snake has bit me.	Amho ek pap juliyo.	Amho huve chawihe.	Ai hapo chawiyo.
Bring some grass for the horse.	Ghodo wate khod lawe.	Khoda kota khor leia aw?	Khoda khato charo lawe.
How much money have you?	Tuho pa kotro tukke he?	Tum pahe keta pachu hoi?	To pahi paiso kota he?
I am very poor.	Me ghunno nublo che.	Me bhari kungal hoi.	Ai bhari ghurrub moho.
He is very drunk.	Chu ghunno mutwals che.	Toho bhari chakit gyo.	To bhari hodo pidlo he.
He beats his wife often.	Chu ghunno khute bairi he.	Toho bhari baire kute he.	To tihan bhari toke he.

English.	Pauria.	Wurralee.	Infra Sathpoora Bheels.
He ran away but was caught.	Chu nahe gyo to dhuorra gyo.	Toho bhag gyo to ait gyo.	To polo wagiyo puntiyu gyo.
I saw him strike that boy.	Me choro morte dekhe.	Me aitu poiro morlé dekho.	Ai eplo poiro tokhta dekhiyo.
He is a very old man.	Chu ghunno dayo che.	Toho bhari doho hoi.	Eplo bhari dhoho he.
My son is very ill.	Amro choro hoto mando che.	Ma cho jubboo mandio ho.	Amho poiro bhari dukho he.
Are there any fish in this water?	Heno pahuno masa che?	Ya paima mase he?	Ya pahime machi he?
Show me your foot.	Taro pai amro dekharo.	To pag dekhare.	To pag dekhawe.
Do not quarrel with him?	He no hatho khujjo ma kurro.	Ya rarma kohiye.	Ya ari car ma kehe.
Is this good water?	He pahi hajo che?	He pahi hajo hoi?	He pahi haro he?
Bring me a bow and arrow.	Am wato ek bilko dunli lawe.	Mahe dhunlee bilkee leta aw.	Mane toho kande de.
How much has he paid you?	Chu tumo kotro paihe apihe?	Toho kotlo pachu api he?	Tuno koto paisa deda he?
Which is the road to Roshmal?	Roshmalno wat kenli?	Boimal wato kehe jae?	Roshmal wat kende he?
What is the name of this village?	Yene gaonno nao kai che?	He gaon nao ke hoi?	Ye gaow nao kai?
Have you taken the medicine?	Tu sal khado ka?	You ohor khade?	Tuwo ohor ledo?
He has not yet arrived there.	Wewe lugun che na gyo.	Toho teho poho tooh na.	Amli luggo teho na jai pocho.
Come with me to-morrow morning.	Andhare me hate awyo.	Kal maharo awje.	Kal amhare awje.
He has sold all his corn.	Chu apno danu haro wup deyo.	Toho budda dana wechi.	To apo huggo dana wecha ha.
He has brought some tobacco.	Hene kai bhang mol lido.	Toho phang wechto ledle.	Toyo thoro phang wechto ledho.

(Signed) A. ELPHINSTON,
Collector and Magistrate.

(Signed) C. P. RIGBY, Lieutenant,
Western Bheel Agent.

(True Copy.)
A. MALET,
Chief Secretary to Govt.

ART. VIII.—*On the nature of the Soils of the Bombay Presidency.*

By Surgeon C. F. COLLIER, 2nd Bo. Light Cavalry.

In forwarding the accompanying Map and Report, I have studied far less the minutiæ of Geology than the nature of the different soils of plains, and rocky formations in the mountainous range of this Presidency; such information being alone important to the Geographer.

It may guide his judgment, 1st, as to the capabilities of the soil, and irrigation, the chances of artesian wells; 2nd, as to the materials for roads, and the probable site of minerals.

CHARLES FREDERICK COLLIER,
Surgeon, 2nd Regt. Light Cavalry.

THE territory of the Bombay Presidency extends at the present date from 16° to 30° North latitude, and from 67° to 76° East longitude.

The South and North Concans are separated from the upper-lands of the Deccan, and Doab, by a range of mountains, extending from south to north, averaging different heights from two to five thousand feet; abruptly rising from the sea side, but gently sloping towards the east, until the table lands of the Deccan merge in the plains of the Hydrabad provinces.

The range sends off a principal branch almost due east to the Candeish districts, and terminates by another in a similar direction, called the Rajpeepla hills.

North-west of these last mountains begin the low alluvial plains of Guzerat, through which the rivers Taptee, Nerbudda, Mahyee, and Subburmuttee, take their course. These plains extend northward to Mount Aboo, in the petty State of Serohee, and towards the east as far as the hills of the Mahee Kaunta. In the west, they end in the Gulf of Cambay, the large and small *Thulls* (or deserts), and that extraordinary tract the *Runn* of Cutch.

The provinces of Kattyawar, Cutch, and Scinde, form the north-western boundaries.

It has been my lot to visit nearly all this tract of country, excepting Cutch, and I trust that some qualified individual will fill up the hiatus I have left in the accompanying map. I have strictly restricted myself to simple facts on the Geological structure of this country. Theories and conjectures would probably deprive these pages of the mere practical information they are meant to convey to Geographers.

Section 1*st.*

From Vingorla, through Belgaum to Dharwar, 130 miles East.

At Vingorla, and along the coast, the rocks are basaltic, and in many places columnar, travelling in an easterly direction, through Bētzee and Banda, to the Mountain Pass denominated the Ram Ghat. The trap rock is met in all its forms. Basaltic dykes piercing more ancient beds, and porphyry, amygdaloid, and green-stone overlaying trap, occur everywhere.

The rocks contain beautiful specimens of chalcedony, and other siliceous minerals, phrenite, mealy and needle zeolite, together with green and white feldspath. The detritus of trap forms principally the red soil of the country, and in many places extensive basins of laterite are seen, which, quarried, afford excellent building material to the natives.

Ascending the mountains, which range from two to three thousand feet in height, the overlaid strata at last emerge from the trap. They take an oblique direction, and are met in the following order:—1st, Mica schist, in which are found common and precious garnet; 2nd, mica slate; 3rd, compact slate; 4th, gneiss. These are crossed by numerous veins of quartz, from which enormous blocks separate. The same structure is observed on the eastern side of the summit, but it soon disappears beneath the overlaying trap, which continues to Belgaum.

Taking a southern direction, towards Dharwar, half way between Hoogly and Teighur, a considerable range of quartz hills pierces the trap. The detached blocks from them are particularly white and transparent. At Dharwar, beneath the morhum the trap is decomposed into a very white substance, unctuous to the touch, and possessing all the properties of kaolin. It might probably be used with advantage.

Taking a northern direction, towards Padshapoor, twenty-two miles from Belgaum, N., I observed a narrow strip of old sandstone and sandstone conglomerate, some miles in breadth. I took the trouble to

examine this tract for some way east and west, and found that it accompanies very closely the windings of the Gutpurba river, celebrated for the Gow Wauk Falls ; and it appears to me that the action of the water has denuded the valley of its former overlaying trap, and exposed this first transition rock. The sandstone, if I may judge of some wells, is of great depth. Eastward, near Kulludgee, slate rocks dip beneath the sandstone.

Notes on the Mineralogy of this section.

From the coast to Dharwar, iron ore abounds in many places. Itinerant smelters were met by me at Teighur near Dharwar. They pick up the ore on the surface of the hills, selecting the heaviest; and, maugre their primitive means, produce the iron with profit. The iron ore found at Malwan, and brought long ago to the notice of Government, by my friend Dr Gibson, is very rich, and well worthy of serious attention.

Section 2nd.

From Panwell to Poona, seventy miles East.

A journey between these stations will show nearly the same Geological formation as described in the last section—that is, trap, with the usual accompaniments of porphyry and green-stone dykes, &c. I descended the famous ravine at Khandalla, and found each side trap down to the Concan.

It is only at very elevated spots that the overlaid rocks show themselves, where they seem to have been denuded by atmospheric causes. I have seen them at Bheema Sunker, fifty miles N. E. of Chowk, while engaged on a survey in 1829. The order of primitive rocks seen, is always the same—mica schist, mica slate, compact slate, gneiss.

Fragments of old red sandstone are occasionally met in the plains and beds of torrents, but I suspect that tracts of that formation are rare; though, as will be seen, they are to be met with, and their importance deserves especial notice when they are.

Section 3rd.

From Padshapoor to Malligaum, 400 miles N.

This is an important section, as it intersects those described from south to north. The old sandstone formation already noticed, ceases

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abruptly at Padshapoor, and northward to Malligaum the whole country is trap. I have travelled in that direction six times. I have visited Mahableshwur, and diverged in sundry directions from the direct route. Everywhere the same superlaying trappean formation meets the eye. Mahableshwur, in my humble opinion, seems a more recent irruption of trap, overlaying that of the Deccan.

The abrupt rise of this vast chain of basaltic mountains, in the proximity of the sea, precludes the existence of any important rivers in the southern part of the western coast. Those which exist are navigable but a little way, and are formed by mere torrents in the rainy season. An examination of their beds shows nothing but fragments of those rocks which have been described in the preceding pages. The detritus and silt conveyed by these turbid streams during the monsoon, are considerable, and form deluvial deposits which are rapidly encroaching upon the sea, especially in the northern parts of the Concan.

Considerable rivers arise from the chain of hills upon the eastern side, such as the Bheema, Kristna, Nera. These traverse the Peninsula, and discharge themselves into the Bay of Bengal.

I have examined the beds of those rivers. In all, fine particles of oxide of iron, which have been disintegrated from the trap rocks, form extensive layers of iron sand. I have analysed this sand, and discovered no trace of other metals.

The basaltic region already described, terminates in the north by a singular range of low isolated hills, seldom exceeding a thousand feet, and rarely less than 200 feet, which ceases in the valley of the Taptee at Mundoorba.

Section 4th.

From Tankaria Bunder, through Baroda, to Mhow, W. and East 300 miles.

From Tankaria Bunder to Baroda a deep alluvial sandy soil covers granite. About thirty miles east from Baroda superlaying trap rises through these, and forms the high hill of Pawnghur or Champaneer: granite re-appears again at Reeghur, with occasional overlaying porphyric rocks. A tract of gneiss is observed, then mica slate and compact slate, then quartz, and finally a wide tract of old red sandstone; when the trap Venidya mountains arise, and are followed up to Mhow. Towards the east side of this range, the late Dr Malcolmson found the lacusterine tertiary fossils, mentioned in the Geographical Transactions, and establish-

ed from them the important inference, that the Venidya mountains were elevated at a comparatively recent period.

He identified the fossils as Physa Prinsepii, Paludina Deccanensis, Linnea Subulata, Melania Quadrilineata, Cypris Subglobosa, Cypris Cylindrica. I notice these discoveries of the late Dr Malcolmson the more readily, that in all the range of country which I have already described I have not met with a single fossil remain.

Section 5th.

From the East of Surat twenty miles to Mount Aboo, from South to North 270 miles.

A westerly off-set of the Candeish range divides the valley of the Taptee from that of the Nerbudda at Nandode. Crossing the Nerbudda, we have an alluvial valley, extending about twelve miles; and then ascend the Baniar range of hills, which stretches north to the hill of Pawnghur or Champaneer, (already mentioned,) the last of them, and about 2000 feet high.

These hills are still principally trap, but the denuded series of the overlaid rocks are far more frequently seen in the usual order of gneiss, mica slate, quartz, pursuing the route still almost due north, over a deep sandy alluvial soil to Hursole, where trap is again seen, but soon afterwards ceases. We find then very regular strata of rocks in the following order: 1st, Ahmednuggur, old sandstone; 2nd, Sablee, mica and compact slate, and mica schist; then gneiss, and finally granite at Eder. Ascending still, we find gneiss at Poosena, succeeded by mica slate; and Mount Aboo, the extreme point of this section, is formed of the primitive rocks, the summit being granite, with ridges of pure quartz.

Proceeding east of the above route, towards Dungarpoor, we have a well marked series of transition rocks of clay slate, limestone (black and white marble included,) coarse slate, and graywacke. At Jumbooree occur ridges of pure quartz, and at Sommeyra, west of it, mica slate, and very thick beds of mica schist.

With Mount Aboo, the hills of Marwar, Surrohee, and Mahee Kaunta, terminates the eastern semi-circular hilly boundary of Guzerat. From these hills to the west are the low and slightly undulating plains of Guzerat, the soil of which varies according to its proximity to hills, but becomes more uniformly sandy as it approaches to the sea. The whole of this extensive country is alluvial, and evidently regained from

the sea, whose boundaries are gradually becoming more shallow as the rivers pour their silt in the Gulf of Cambay, and obstruct it more and more with banks. The rivers Taptee, Nerbudda, Mahyee, and Subburmuttee, account for those extensive deposits. There are, however, rivers, arising from the Serohee hills and Marwar, which must have been more considerable formerly than they are now. The Surruswuttee, Bonass, and Loonie, leave their beds dry soon after the rains, and percolate merely through the sand during the greater part of the year, and are lost in the Runn of Cutch.

The shores of these rivers will doubtless yield, when better searched, some treasures to the Geologist; and they doubtless contain very interesting fossils.

In the conjunction of the Subburmuttee and Kaira rivers at Burra Buroo, was some years ago a fossil remain of an animal some seventy feet in length. This information was first given me by my friend Major Holland, and I verified it in 1837. The remains had indeed been very recently washed away, but the natives were very unanimous in their account of what they termed *a burra muggur*, or large alligator. One of its vertebræ had been preserved by the late John Williams, Esq., Political Commissioner, and I examined it. It was the dorsal vertebræ of an Inguinodon, and its size may be judged from its being used as a stool.

The probability of such interesting remains being found hereafter, is confirmed by certain deposits, first discovered by Dr. Lush, in the island of Perim, opposite the mouths of the Nerbudda, but subsequently ascertained to exist in many parts of the east of Kattyawar. Through the kindness of Sir Robert Arbuthnot, I obtained many specimens. These were identified by the late Dr. Malcolmson, as similar to those found in Upper Central India, and doubtless have been washed down by the currents of the Nerbudda, Mahyee, and Subburmuttee rivers. These brecchiæ occur on Perim along the shore in distinct beds of conglomerate, separated by layers of sand. No. I. of the Journal of the Bombay Branch of the Asiatic Society, July, 1841, gives an account of the fossils. Among those I secured, was a perfect head of the Gavial (Crocodilus Gangeticus of Cuvier),—an inhabitant of very large rivers.

Section 6th.

From Ahmedabad, through Rajkote, to Joonaghur, 200 miles from East to West.

From Ahmedabad to Tolsana, through Dundoker and Shapoor, sandy

loam. At Tolsana the Little Runn is crossed over a gravelly quartz ground, mixed with salt, crackling under the feet. We pass on, approaching Wudwan, a salt lake; and at Wudwan the rock is trap, overlaying old sandstone. At Churrira, a village twenty-four miles west, old sandstone prevails, and soon after to Rajkote trap.

From Rajkote to Joonaghur, the country appears to me all of trappean formation, and in many places obsidian is found in great abundance. As we ascend Joonaghur we leave the basalt, and again meet the primitive rocks, compact slate, mica slate, veins of quartz, gneiss, and granite.

Section 7th.

From Gogo, through Rajcote, to Baleecheree, 160 miles.

At Gogo, Captain Fuljames had occasion to attempt boring for an artesian well. He passed through—1st, loose sand and earth; 2nd, conglomerate of sandstone and clay; 3rd, yellow and whitish clay; 4th, conglomerate as before; 5th, lime and sandstone; 6th, conglomerate; 7th, hard clay; 8th, conglomerate.

Immediately on leaving Gogo, overlaying trap begins, and continues without change across the Peninsula of Kattyawar to Baleecheree, on the west of the Gulf of Cutch.

As in the trappean formation of the Deccan, the basaltic soil is pierced by numerous dykes of porphyry and green-stone.

In many places the trap rocks have become decomposed, and formed extensive lamelar beds of what to all appearance would be soft and porous new sandstone formation. As it is supperposed upon the trap, it can have no other origin; but it can be split into plates, and bears every evidence of having been the detritus of the rocks above gently deposited by the turbid water which contained it. I have fancied having seen on some of the slabs of this substance foot-marks of animals but fancies will not do for a strict report. The inhabitants of Kattyawar find this in great abundance, and everywhere build from it, and sometimes make it into dripping stones. (I send a specimen.)

Iron ore is found in many places, and at some (Hallar and Burda) worked by native melters. Near the village of Darooka copper is said to be found. The ore which a native brought me from the spot, was iron ore.

Before I close this section, I may mention that the height of the Joonaghur hill or Girnar is about 3508 feet above the level of the sea, and to me it has all the appearance of an ancient volcano, with a vast crater, one side of which had broken down, and with its debris formed the slope by which the summit is approached from the town.

Section 8th.

From Deesa, near Mount Aboo, to the Jessulmeer range of hills.

From Deesa to the hills is a mere undulating sandy desert.

Jessulmere, 71° E. long., is a rock of yellow limestone, containing innumerable fragments, and fossil marine shells.

The chain of hills in the neighbourhood of the ancient site and ruin of Chotun, may be described as follows:—1st, Chotun hill, mica slate and schist; 2nd, Boton hill, extreme south of the range, and 1500 feet high from the plain, is of granite; 3rd, Junahoo hill, 1200 feet due north of the last, gneiss and mica slate; 4th, Korara hill, west, 500 feet, mica slate; 5th, Balmeer, east, 700 feet, overlaying trap; 6th, Zuna hill, north of Balmeer, 200 feet, old sand-stone; 7th, Jessrai hill, north, 1200 feet, granite. Towards the north of these are sandy plains, with a chain of low trap rocks and nodules.

East of Balmeer are large sand hills, and between beds of gypsum overlaying sand.

Note.—Near Palee, a town in the same latitude as Balmeer, but near the Serohee province, is a hill called Purmadhur, which contains leadore.

Section 9th.

From Deesa, through the Runn and Desert, to Hydrabad in Scinde.

From Deesa to Soweegaum we traverse sandy loam, and four miles from the latter place we reach some sandy hillocks, and suddenly enter upon the Runn.

No one who has seen this strange haunt of the wild ass, this desolate region of the mirage, can hesitate to pronounce it the deserted bed of an ancient inland sea. At Dooherwara, and on many points of its shore, are hardened argyle rocks containing marine shells.

Crossing the Runn to Nara Bet, an island in the salt plain, we find it principally composed of old sandstone, and over its surface are several

springs of very brackish water, though drank by men and cattle. I imagine, from some experiments I made, that the saltness is due to the superior strata of mould, and that were wells dug, the springs would be fresh water.

Eighteen miles from Nara Bet to Byrana, we reach the opposite shore of the Runn, which is composed of sandy loam. Eleven miles from this, at Rames-ke-talao, the rocks are trap, with occasional rolled fragments of granite, gneiss, and slate. South of it, above two miles, is a very interesting dyke of granite, in boulders which rise abruptly, as forced through the trap like a gigantic wall a height of, I should judge, one hundred feet, and extending over a great length of ground. At Vereevou, eight miles, we find old red sandstone. Here, taking a western direction, in a line with the northern shore of the Runn, the Thur Thull or Desert is crossed through the following villages, if a few herdsmen's huts deserve that name :—Kurnooree, Jehangroo, Anearee, Oonree, Dullooree, Shoree, Deepla, and Soomree-ke-Kooree, about 117 miles.

The Thul is neither more or less than the dried up delta of a great river (probably the Indus) which formerly debouched into the Runn.

The sand ridges are low, rarely averaging more than eighty or 100 feet, and invariably taking a southerly direction. The loose sand of these ridges is superficial only. At some depth, it is intimately mixed with clay, and the valleys between these ridges are pure blue clay. I counted no less than thirty-four of these sandy ridges in a distance of fifteen miles; but they are not always so numerous. Nothing can be more completely deceiving than to look down on the valleys from the ridges before, or even some time after sunrise. Low clouds fill the valleys, and they simulate perfectly the broad streams which formerly flowed in these deserted beds. I picked up many fossil corals.

Traces of the inundations of the Indus, and indeed the course of its superfluous waters, during its common inundation, brings its present limits near the fort of Omercote.

The probable reason of the change of direction of the Indus would be its filling the Runn with silt and detritus. This ancient sea, locked between Kattyawar, Cutch, and Scinde, would little oppose such deposits, and soon choke the mouths of the Indus.

This must at some period have caused an inundation of Scinde, and the waters, checked at last by the Hala mountains, would in such case

seem to have settled in their present bed, and formed the present Delta of the Indus. One branch only (the Goondee) resumed its course in the Runn in the earthquake of 1819.

Within four miles of Wangia Bazaar, the Thull ends, and the alluvial soil of the Indus begins. Within twelve miles of Hydrabad the low lime hills of Scinde arise—the second, I think, of the oolitic group. (Tertiary epoch Miocene of Lyel.) They present a rich field to the geologist, and nowhere have I seen fossils and marine shells in such amazing numbers and variety. I forward drawings of some of them, and have already sent to the Society a small collection of them.

There is a peculiarity about these hills. They seem to rise abruptly from the alluvial soil, as if they had been upheaved by a sudden convulsion of the earth, like the Ulla Bund of the Kimree, in the earthquake of 1819; but such appearances are deceitful. Every hill around Hydrabad for many miles is of the same description.

Section 10*th.*

From Hydrabad to Kurrachee, through Jurruk, Tatta, and Ghurra, 110 miles.

The whole of the road passes through the alluvial blue clay or soil of the Indus, alternating with lime hills rich in fossils up to Jurruk and Tatta.

The alluvial soil is left soon after leaving Tatta, and the soil is composed of calcareous sand and grit, with low hills of lime of a red colour and rich beyond description, with marine fossils of all kinds,—at Gharra especially. From Gharra to Kurrachee these lime hills gradually merge into coral rocks.

At Kurrachee I observed the projecting rocks to Minora Point, and likewise the part of the coast called by Europeans Clifton. The whole of these massive rocks are composed of fossilized coral rocks, resting on sandstone. In the sandstone are found fossilized shells, converted in iron ore. West of Kurrachee, high hills of lime, containing a vast quantity of fossilized coral rocks, are ascended; and at a distance of ten or twelve miles some hot springs are met. They spring from lime rocks, and at their sources the heat is intolerable to the hand; but the water, after passing through several small troughs, finally expands itself into the well-known muggur tullao, or crocodile tank.

The water when cold is tasteless, has no sulphurous smell, and appears to me very pure,—deriving its heat, most probably, from the great depth it has to ascend.

Observations.

Any one who has waded through the past dry details will easily perceive that the Geological structure of this Presidency offers little difficulty in explanation.

The gradual deposit of primitive rocks formed the strata of mica slate and schist, and again the decomposition of this last the old sandstone beds discovered at various points from Dharwar to Mount Aboo, and Kattyawar.

The subsequent trappean irruption covered afterwards these deposits, and in various places from the action of rivers, and at others from decomposition by the atmosphere, these overlaid strata have been laid bare.

Again, the trap rock has become decomposed, and formed three very distinct depositions. 1st, The laterite, or common detritus, found everywhere in the Concan and Deccan. 2nd, The Kaolin (if I am right) or white decomposed trap, as found beneath the superficial rock at Dharwar. 3rd, The fossil sandstone, as found near the coast from Surat and throughout Kattyawar, of which I send a specimen. This would seem to have been formed by the action of water depositing it in layers, and a similar formation is now going on upon the northern coast of Kattyawar by the alternate flow and ebb of tide.

Of all the above strata, the most interesting probably to Government is the old sandstone, beneath which coal-fields may be found; but in any search for coal which might be instituted, ease of carriage by land or water is of the first importance. The province of Kattyawar would promise well as a coal country.

If coal be found in the tract of sandstone between Peshawur and Belgaum, it could not without great difficulty and expense reach the coast; but as employed on the spot in the smelting of the iron ore, so abundant in that part of the country, it might be made an important source of revenue.

I need merely allude en passant to the old sandstone being the matrix of the diamond, and that the gem is found in tributary streams of

the Kristna. Old and marine limestone are rarely met in the country, and I have only seen it near Doongapoor east of the Mahee Kaunta, or in some parts of the Runn.

Metallic ores, excepting those of iron, I should deem scarce in this Presidency, for the beds of torrents and rivulets near the mountains would betray their presence.

There is a source of wealth in the abundant and fine salt of the Runn; but why it has been neglected, is not now within my province to discuss.

NOTE.—Dr Collier's Map has not been published. The Society does not hold itself responsible either for the facts or the doctrines of those contributing to its Transactions. We are at a loss to discover the difference betwixt the Mica Schist and Mica Slate of Dr Collier: the two names are generally given to the same rock. The Mahabuleshwar Hills do not consist exclusively of Trap—they are covered with Laterite. The Perim Fossils were first identified by the late Mr Prinsep. (See Bengal Transactions, 1837, Vol. V.) The animal alluded to as an Iguanodon, seems to have been the skeleton of a Whale. The Coal formation lies above, not below the old Red Sandstone. The stratified rocks in Kattiwar, belong to the Nummulite series, and are much higher up than Coal measures. —EDITOR.

ART. X.—*On the Roads in Malwa.* By R. N. C. HAMILTON, Esq., Resident at Indore, and his Assistants.

No. 1173 of 1850.—*General Department.*

To the Secretary to the Geographical Society.

SIR,—In compliance with the expressed wish of the Resident at Indore, the Right Hon'ble the Governor-in-Council has instructed me to forward to the Society, a Copy of the accompanying Papers on the Roads in Malwa.—I have the honor to be, Sir, your most obedient servant,

J. G. LUMSDEN, *Secretary to Government.*

BOMBAY CASTLE, 30*th March*, 1850.

(Copy.) No. 56 of 1849.

From R. N. C. HAMILTON, Esquire, *Resident at Indore.*

To Sir H. M. ELLIOT, K. C. B.,

Secretary to Government of India, with the Governor-General.

DATED INDORE RESIDENCY, 11*th July*, 1849.

SIR,—The importance of improving the lines of inter-communication in Malwa, has, from my first coming here, occupied my attention, and been the subject of some correspondence. I have now the honor to submit a connected report on what has been done in furtherance of this object, within the several states and districts under this Residency.

2. The Agra and Bombay road is made by the Government up to Indore from Agra, and is in good order: this portion is under the Superintendent, Captain Campbell. Between Indore and Mhow, and thence to the top of Kilner Ghaut, and from the end of the Ghaut to the Nerbudda, it is not in good order,—in some parts hardly marked out, and nothing in the shape of repairs has been done by the Executive Officer, owing to delay in the Military Board's sanction. The Kilner Ghaut is a fine work, and in fair order.

3. From Indore to the Nerbudda, is under the Executive Officer at Mhow.

4. Three years ago, the Durbar, at my recommendation and under my supervision, metalled the road from Indore to Rao, a village half way to Mhow, and I would have continued this work to Mhow at the Durbar's expense, but the Engineers would not determine the line. Each Officer (Captains Kilner, Burke, Brown, Gilmore, Campbell, and Abbott,) has, I believe, examined the line, which has been repeatedly surveyed without a result: this matter, however, would be settled immediately were the superintendence of the Agra and Bombay Road Engineer extended to Mhow, and not stopt at Indore, for in that event Captain Campbell, the present Officer, would have to act and work without his attention being distracted by other duties.

5. From Indore by the Simrole Ghaut, to the Nerbudda, a capital unmetalled road has been made: the Simrole Ghaut is now easy for wheel carriages, and is a great public convenience, this being the main line to Boorhanpore and Aurungabad.

6. Lieutenant Keatinge afforded valuable assistance in making the road through the Ghaut, and lining it out the whole distance from the Nerbudda: a road has been cut cross the valley of Nimar to Boorhanpore, and the banks of the Taptee.

7. During the famine and distress in Nimar, this work was mainly executed, and afforded the means of living near to their homes to the rural population, who, but for this aid, must have emigrated or deserted. The cost to the British Government was only 2,035 Rupees.

8. A sum of Rs. 18,742-4-6 has been expended in making 108 miles: this would give a rate of 173½ rupees per mile, but of the sum, 9772-14 was expended on the cuttings, and making at Simrole Ghaut, and 3000 at the Kaithee Ghaut between Asseergurh and Boorhanpore,—so that the cost per mile averages near 32 rupees.

9. To maintain the Ghauts at Simrole and Kaithee in repair, a light toll is levied on laden vehicles, which is readily paid, and which, added to the customs which the Holkur state have made available for the purpose, yield a sufficiency to keep the entire line in good order.

10. I beg to draw attention to Captain Evans' report and statements, which form enclosure No. 1, and to a Copy of a letter from the Secretary to Government, Bombay, by which an arrangement has been made with the Nizam's Government to open the Ajunta Ghaut, by which the line to Poona will be opened, to the great advantage of the Cotton districts of Berar, which will come on the road at Bodur.

11. Accommodation for travellers has been provided, such as dhurrumsalas, wells, &c., and bungalows have been constructed between Indore and Ajunta. Between Ajunta to Aurungabad, two bungalows are required to complete the line between Agra and Bombay via Ahmednuggur and Poona, as there are bungalows the whole way from Aurungabad.

12. A good road was opened from Boorhanpore towards Hussingabad, along which the jungle was cleared to the Hurda Hinda (British) boundary, where the work ended: this is a most important route, as by it the produce of the upper valley of the Nerbudda is conducted into Candeish.

13. Another road has been opened from Mundlaisir to Oonkar Mandatta, which crosses the Simrole line near the Nerbudda.

14. The Holkur Durbar are now re-making the road at the Jam Ghaut, originally constructed by the Ahilya Baee : it is a work in which the young Chief and the Mahsahib take much interest, and when completed will be a great convenience.

15. A road has been commenced at Indore joining the Agra and Bombay line, branching to Bhopal and Saugor : of this line, from Indore to Peeplia, about thirty miles, is made. A difficult Ghaut at Ragoogurh, two miles in extent, has been more than half cut through, at the joint expense of Holkur and the Thakoor of Ragoogurh : this will be completed in the course of the next month. Between Peeplia and Tuppa (Sindia,) will be lined out after the rains, if the Gwalior Durbar will (as I dare say they will) sanction the expense ; and from Tuppa through the Bhopal State, and to the confines at Bhilsah on the Saugor side, Captain Cunningham has lined and made nearly the whole extent, besides bridging and greatly metalling the road connecting the town of Bhopal with Sehore, a distance of upwards of twenty miles.

16. There are bungalows between Indore and Sehore, and others will be constructed between Sehore and Saugor. So far as Native States are concerned, this line of road, which in fact connects the Saugor and Mhow Cantonments as far as it has gone, has been laid out without a rupee expense to the British Government.

17. A fair-weather road has been cleared from Bhopal to Hussingabad. Enclosure No. 2 is Captain Cunningham's report.

18. A road from Indore towards Oojein and Mehidpore has been commenced at Holkar's expense ; but the progress yet made has not exceeded a few miles : the want of able superintendence is an obtacle I have great difficuly in overcoming.

19. From Indore towards Bhopawar via Dhar, is the Baroda line : of this sixty-four miles, nearly forty-seven have been lined, cleared, and made easy for laden vehicles, and the remainder will be constructed after the rains.

20. Captain Wilkie's report forms Enclosure No. 3. Some cross roads through the Bheel-jungles have been cut, and opened to facilitate commerce and traffic passing from Rutlam to Bombay, so as to save parties from going a long round : these, though small, are most important works : they are detailed in Enclosure No. 4.

21. On Captain Eden's return from leave, I requested him to examine and report on the Agra road. No. 5 is his memorandum, and embraces from Dhoolia to Indore.

22. I beg to state, that the Holkar State has consented to defray half the expense of making the portion of this road between the Nurbudda and Sindwah, on the application of the Bombay Government. Enclosure No. 6.

23. I have great satisfaction in stating, that a handsome stone bridge of eleven arches, is in course of construction, at the expense of Her Highness the Bheema Baee, over the river opposite to Indore, which during the rains fills to an extent to cut off all communication some times for days.

I have the honor to be, &c.,

(Signed) R. N. C. HAMILTON, *Resident.*

INDORE RESIDENCY, 11*th February*, 1849.

(True Copy.) (Signed) W. F. EDEN, 1*st Assistant to Resident.*

(Copy.) No. 179 of 1849.

From Lieutenant H. L. EVANS, *Political Assistant in Nimar.*

To R. N. C. HAMILTON, Esquire, *Resident at Indore.*

DATED MUNDLAISIR, *5th July*, 1849.

SIR, — I have the honor to reply to your letter No. 757, dated 26th ultimo, calling for a report on the Roads within the circle of my superintendence.

2. The principal roads are as follows :—

1st. From Indore via Boorhanpore to Khandeish and Berar, entering Nimar by the Simrole Ghaut, and passing out of the district,—the former at Loni, five miles beyond Boorhanpore, and the latter at Hutnoor on the Tapty, six miles from the City. The distance that it traverses Nimar is as follows :—Simrole to Nurbudda, 29 miles ; Nurbudda to Asseerghur, 60 miles ; Asseerghur to Loni, 19 miles : total miles 108. Or to Hutnoor, one mile farther. This is the main-road of British and British Sindiah Nimar. All particulars required will be found in the accompanying Tabular Statement.

2nd. From Jaum or Simrole towards Bombay, through the Sindwah Ghaut, being the old Bombay road, now very little frequented.—(The former 74 miles, the latter 98 miles.)

3rd. From Myshur and Mundlaisir to the Hoossingabad districts through Charwar, or near it, passing for a distance from the former place, 64 miles through Nimar. This road is much frequented. —(Myshur to Charwar, 84 miles.)

4th. From Khundwa to Charwar, via Singojee Peeplia, passing for 24 miles through Nimar. Much used. (Khundwa to Charwar, via Singojee, 48 miles.)

5th. From same to the same, via Chinpoor, passing 18 miles through Nimar, rather less frequented. (From Khundwa to Charwar, via Bhamghurh and Chinpoor, 48 miles.)

6th. From Boorhanpore through Seewal and Peeplode, via Chinpoor to Charwar, passing 48 miles through Nimar, also much travelled. (Boorhanpore to Charwar, via Peeplode, 67 miles.)

7th. From the same, striking off at Peeplode to Boorkoond in the Baitool districts (I believe,) passing for about 48 miles through Nimar, the whole way from Peeplode, and indeed from near Boorhanpore, being a dense jungle inhabited chiefly by Gonds. This road is very much travelled. Timber in large quantities, and grain, is brought down, and Bombay goods, cloth, kerana, and salt, pass up. (From Boorhanpore to Boorkoond, 80 miles.)

8th. From Boorhanpore towards Baitool, via Seewal and Bootee Parvitee, passing through the Nimar districts for about 42 miles. I do not know how this road is, never having travelled it, nor do I know the names of the stages, but although passing through a dense jungle with no towns for many miles, it is much travelled. (Distance to Baitool not known—estimated from Native merchants' report at 130 miles.)

3. The tabular statement accompanying, contains all particulars regarding which information was called for: I trust it will be found complete.

I have the honor to be, &c.,

(Signed) H. L. Evans, *Political Assistant in Nimar.*

Nimar Political Agency, Mundlaisir, *the 5th July*, 1849.

(True Copy.) (Signed) W. F. Eden, *1st Assistant Resident.*

SIMROLE GHAUT AND ROAD.

RECEIPTS.

	Rs.	A.	P.	Rs.	A.	P.
Balance 1st August, 1847	239	8	1			
By Scindia's Road Fund, for 1846-47	893	2	11			
By Zukant due for March, 1848	264	11	0			
Credited from dues on Opium May and June, 1848	134	0	0			
Add Revenue of disputed land between Holkar and our Sunbut	1,904	0	0			
Add Revenue of Kusrawud... 67 0 0						
Add Revenue of Kanapoor and Burreah 279 10 0						
	346	10	0			
By Tolls on the Ghaut, July 1848	55	14	6			
By Tolls on the Ghaut, August 1848	59	4	0			
By Tolls on the Ghaut, September 1848	168	10	0			
By Opium dues for October, 1848... 144 0 0						
By Zukant dues for October, 1848... 170 13 0						
	314	13	0			
By Zukant dues for November, 1848	233	10	6			
By Zukant dues for December, 1848	269	1	9			
By Zukant dues for January, 1849	255	9	9			
By Zukant dues for February, 1849	311	0	3			
By Zukant dues for March, 1849	274	0	3			
By Zukant Dues for April, 1849	169	9	0			
				3,992	9	0
Total Rupees				3,992	9	0

EXPENDITURE.

	Rs.	A.	P	Rs.	A.	P.
Expenditure in September, 1847	20	2	6			
Expenditure in October, 1847	6	9	0			
Expenditure in November, 1847	65	8	0			
Expenditure in December, 1847	167	3	3			
				259	6	9
Expenditure in January, 1848	311	2	0			
Expenditure in February, 1848	254	15	0			
Expenditure in March, 1848	77	4	3			
Expenditure in April, 1848	105	12	9			
Expenditure in May, 1848	131	10	3			
Expenditure in June, 1848	116	1	9			
Expenditure in July, 1848	122	10	6			
Expenditure in August, 1848	114	14	3			
Expenditure in September, 1848	127	1	9			
Expenditure in October, 1848	82	2	3			
Expenditure in November, 1848	99	15	9			
Expenditure in December, 1848	133	10	0			
				1,677	4	6
Expenditure in January, 1849	195	12	3			
Expenditure in February, 1849	182	5	3			
Expenditure in March, 1849	209	15	6			
Expenditure in April, 1849	186	14	0	774	15	0
				2,711	10	3
Balance in hand, 1st May, 1849				1,280	14	9
Total Rupees				3,992	9	0

NIMAR POLITICAL AGENCY, *the 5th July*, 1849.

A pucka Stone Ghaut on the Nurbudda, for loading and unloading boats at, has just been completed, at a cost of about Rs. 650, but the full account has not yet been received.

E. E.
(Signed) H. L. EVANS,
Political Assistant in Nimar.

(COPY.)

TABULAR STATEMENT of Roads, Ghauts, &c., in the Nimar Districts, showing repairs executed to them, from 1845-46 to 1847-48 inclusive, and in the past year 1848-49, and at whose expence done.

LINE OF ROAD.	GHAUTS OR PASSES, &c., REPAIRED.	Amount expended from A. D. 1845-46 to 47-48 inclusive.	AT WHOSE EXPENSE.	AMOUNT EXPENDED IN 1848-49.	AMOUNT WHENCE RECEIVED.	REMARKS.
Indore via Boorhanpoor to Khandeish and Berar, passing for 108 miles through Nimar. The whole of this road now is very fair except between Dhewgaum & Deisgaum, now being made: a good deal requires to be lined out more distinctly than it is at present.	Simrole Ghaut made almost from the beginning, and roads between lined out, smoothed and spread with kunkur, drains and ditches made on the Ghaut, which extends 16 miles from Simrole to Bulwarra, there being in it three separate Ghauts.	10,772 14 0	British... ... 2,035 0 0 Sindhia..... 3,000 0 0 Holkar..... 3,000 0 0 Disputed land... ... 1,200 8 0 Road fund... 1,537 6 0 10,772 14 0	1,702 7 6	From toll on the Ghaut, established by order of Resident. See letter No. 1275, dated 26th Dec., 1848.	During past year the three Ghauts repaired, and the road between spread with kunkur, for a distance of 2½ miles: the work now going on is as above. See annexed account of receipts and expenditure of tolls.
	Road from Bulwarra to Burwai and the Nurbudda, 13 miles cleared of jungle and stones, and here and there lined out.	264 7 0	1 per cent. road fund.	...	...	Will be regularly lined out all the way, ditch dug, and kunkur spread in the centre.
	Road from Kheeri Ghaut, on both sides sloped, and made pucka on S. bank.	256 6 0	Road Fund.. 107 13 0 Mundatta road fund... ... 103 9 0 Boatmen..... 45 0 0 256 6 0	136 8 0	Road fund... 91 8 0 Boatmen..... 45 0 0 136 8 0	S. bank made pucka during the past year.
	Road from Dhungaum Ghaut.	...	...	27 3 0	Road fund.	Small Ghaut sloped.

Line of Road.	Ghauts or Passes, &c., repaired.	Amount expended from A. D. 1845-46 to 47-48 inclusive.	At whose expense.	Amount expended in 1848-49.	Amount whence received.	Remarks.
	Road from Doorwan Ghaut, new line taken.	855 14 0	Mundatta fund... ... 810 14 0	...	...	
	Road from Deisgaum Ghaut, new line taken.	...	Road fund... 45 0 6	...	...	
			855 14 6			
	Bhojakheree, Chehgaum, and Beyrea Gasoor, Nullahs laid with stones, so as to avoid the mud.	82 2 0	Road fund.			
	Road from Boregaum to near Boorhanpoor including Kuttee, Ghatteeasseen pass. Bottipahari, Jhiri, &c. a distance of 19 miles.	5,114 7 0	From Sindhia.	1,793 6 6	Sindhia..... 104 9 0 Road fund... 1,404 10 6 Tolls for March and April..... 284 3 0	From Boregaum to Kattes Ghaut lined out two miles spread with kunkur. Ditto in other parts all the ascents and descents repaired. Work will re-commence (annual repairs) in this month.
					1,793 6 6	
	Milk-bush hedges planted and jungle cut in various places, as on Simrole Ghaut between Dhungaum and Deisgaum, &c.	1,396 11 0 Hedges being 252 12 6	Mundatta road... ... 118 5 0 Road fund... 1,278 6 0		...	
			1,396 11 0			
	Total Rs...	18,742 4 6		3,659 9 0		
Via Mundlaiser to Sindwah.	From Jaum to Mundlaisur jungle cut.	421 9 0	Holkar... ... 250 0 0 Road fund... 171 9 0	...	...	
	From Bulwara to Mundlaiser 24 miles, jungle cut..... ...	407 14 0	Road fund...	...	...	

Simrole to Mundlaisir and Sindwah, old Bombay road not so much used now.	From Mundlaisir for 8 miles a new line, a small Ghaut cut, and jungle cleared, and ascent from Nurbudda sloped.	544	11	0	By subscription... ...	3,430	5	6	244	10	0
					Road fund...	114	5	6			
						544	11	0			
Mhyshwur or Mundlaiser towards Hooshungabad thro' Charwar or near it —a very fair road, much travelled.	Jungle cut as far as Nimar limits, *i. e.* to Bungurda 72 miles, and Moonde; road not lined or nullah sloped, except slightly at two or three places.	361	7	0	Road fund...	248	2	0	...		
					Mundatta fund... ...	113	5	0			
						361	7	0			
Khundwa to Charwar, good road.	Jungle cut, and two large Nullahs sloped, as far as Singajee, 24 miles.	328	6	0	Road fund.				...		
Khundwa to Charwar via Bhamgurh: road tolerable thro' much jungle.	Jungle cut to the boundary Ghora Puchar Nuddee.	125	0	0	Road fund.				...		
Boorhanpoor towards Charwar via Peeplode: an indifferent road, much used.	The Man-Morrea Ghaut made, and jungle cut a little for 48 miles.	1,000	0	0	Sindiah.				...		
From above towards Baitool.	The Man-Morrea pass above.	...				...			...		
From Mhyshwur to Goojree to meet the Bombay and Agra road.	Road lined out and cleared, and jungle cut from Mount Moor to Goojree, 9 miles.	367	2	0	Holkar.						
Mundlaiser via Bheekungaum towards Asseerghur, being the direct road: very jungly and stony, not very much used now.	Jungle cut on both sides, and stones removed; several nullahs sloped to a distance of 42 miles.	1,220	11	0	Holkar... ...	890	5	0	...		
					Road fund...	330	6	0			
						1,220	11	0			

Road fund.	Ascent from Nurbudda, formerly very bad, metalled, and drained; road also repaired, and Kusran Nulla sloped.
...	...
...	...
...	...
...	...
...	...
...	...

Line of Road.	Ghauts or Passes, &c., repaired.	Amount expended from A. D. 1845-46 to 47-48 inclusive.	At whose expense.	Amount expended in 1848-49.	Amount whence received.	Remarks.
From Burwai to Oonkar Mundatta, 8 miles; much frequented, and very bad formerly.	New road entirely made in most parts, very difficult and expensive. Formerly a man went with difficulty, now a cart can go—dhurumsallas also built in many places.	12,560 2 5	...	...	By subscription. Rao Dowlut Sing... ... 650 0 0 Rookmabace 300 0 0 Holkar... ... 2,000 0 0 Buglee Bao. 150 0 0 Powar Dhar. 600 0 0 Zumeendar of Burwai. 100 0 0 Raja of Rutlam... ... 500 0 0 Nawab of Jowra... ... 500 0 0 Sillana Raja. 100 0 0 Salamao... .. 50 0 0 Punch of Rutlam... 75 0 0 Sindwah... . 2,500 0 0 Raja of Satara..... ... 1,000 0 0 Baeezabace.. 101 12 0 Hurda and People.... 381 9 0 Kunjurs tank 700 0 0 Rajah Bhao. 1,000 0 0 10,708 5 0	Balance due by Rajah Bhow Phunsia, Rs. 1851-13-5.

N. B.—Road Fund for 1847-48 Rs. 1,769-13; expended in 1848-49,—1,767-15½.

(True Copy.)

Nimar Political Agency, Mundlaisir,
5th July, 1849.

(Signed) W. F. Eden,
1st Assistant Resident.

(Signed) H. L. Evans,
Political Assistant, Nimar.

(Copy.) No. 85 of 1849.

From Captain J. D. CUNNINGHAM, *Political Agent in Bhopal.*

To R. N. C. HAMILTON, Esquire, *Resident at Indore.*

DATED SEHORE (BHOPAL,) *June 28th,* 1849.

SIR,—I have the honor to acknowledge the receipt of your letter No. 755 of the 26th instant, requesting to be furnished with notice of the Roads within the limits of this Agency.

2. In reply I beg to state, that the only new roads in progress in this Agency are, with the exception of the trunk road from Agra to Bombay, those being made by Bhopal: all the other roads are the common tracks of the country, to which nothing is ever done except at some passages of streams, and some ascents of hills, where a few repairs must of necessity be executed every year after the rainy season.

3. In Bhopal, such portion of the Mirzapoor, Saugor, and Indore road as lies within the principality, is being made anew throughout, under my direct superintendence. Of a total distance of 90 miles, the portion of 20 miles between Bhopal and Sehore is almost complete, and the portion of 26 miles between Sehore and Ashta is complete, excepting as to the drainage. The further particulars of these two portions of road, are as follows :—

BHOPAL TO SEHORE.

20 miles long and 30 feet wide, of which 18 feet are or will be metalled.

56 Masonry Drains, viz.
- 2 of 1 arch of 15 feet.
- 1 of 3 arches of 9 feet.
- 6 of 4 to 6 arches of 6 and 7 feet.
- 47 of 1 to 7 arches of 1 to 4 feet.

7 Dry stone drains.

14 Miles metalled.

6 Miles remaining to be metalled.

1 Ghaut or ascent quarter of a mile along the side of a hill, road 22 feet wide, in some places built up to a height of 9 feet.

1 Ghaut of a furlong (leading up to the fort of Futtehgurh,) 50 feet wide, and built up to a height of 4 feet.

1 Serai for Travellers, 150 by 100 feet, of unburnt brick, and tiled over.

SEHORE TO ASHTA.

26 Miles long, with a width of 30 feet.

3 Miles metalled.

23 Miles simply well-raised.

1 Masonry Causeway (close to Sehore) of 300 feet completed.

4 Small drains completed.

1 Causeway for carriages, with a narrow foot-bridge of 5 arches of 20 and 2 of 15 feet in progress.

1 Bridge of 3 arches of 15 feet in progress.

1 Staging Bungalow (at Ashta.)

4. It is proposed to line out the remaining portions of the road towards Bhilsa and Tuppa respectively, after the present rainy season; and during the next year it is hoped that the road from Bhopal to Hoshungabad may be similarly lined out. When these roads are completed, the agreement lately entered into with Bhopal, at the instance of the Supreme Government, will have been fulfilled.

5. The sums hitherto expended on roads in Bhopal, amount to about 45,000 rupees, and the Regent is prepared to expend a lakh and a quarter of rupees in all, on the main lines of communication abovementioned. The other portions, however, will not be made in the same expensive way as that between Sehore and Bhopal, which promises to be one of the best pieces of road in India.

6. The Post-Master General N. W. P. has within the last two years directed the letter-bags to be carried direct from Bhilsa to Hooshungabad. The distance is 67 miles, and it has been tolerably well cleared of jungle in the wilder portions by the Bhopal State.

7. Maharajah Sindiah has advanced 5000 rupees for the purpose of building two staging Bungalows at Bhilsa and Ghearispoor (on the Mirzapoor and Indore road,) and it is intended that these shall be commenced upon after the rainy season.

I have, &c.,

(Signed) J. D. CUNNINGHAM, *Political Agent in Bhopal.*

BHOPAL AGENCY, SEHORE, *June 28th*, 1849.

(True Copy.) (Signed) W. F. EDEN, *1st Assistant to Resident.*

(Copy.) No. 131.

From Captain D. WILKIE, *in charge Political duties, Bhopawur.*

To R. N. C. HAMILTON, Esquire, *Resident, Indore.*

DATED BHOPAWUR, *3rd July,* 1849.

SIR,—I have the honor to acknowledge the receipt of your letter, under date the 26th ultimo, No. 756.

With regard to the state of the roads within the circle of my supervision, I may here premise that it is only within the last three years any particular attention has been paid to them beyond an occasional repair by the local authorities on the occasion of the Resident or myself passing through their particular line of country.

The first step towards making a good road was when you deputed Mr Taylor to mark out the one from Dhar leading to Indore, as being one of the principal thoroughfares. This has been carried out as far as the river Chumbul, a distance of 15 miles, and to the extent of the Dhar boundary in that direction. This road remains in good order, but it would be a great object if it could be metalled: the expense would not be very great, and I am in hopes in time to accomplish it.

During the past year the road from Bhopawur to Amjheera, and thence to Sooltanpoor, has been completed, a distance of 16 miles, all but the metalling: there remain 6 or 7 miles further to finish, when it will join the road at Dhar.

The above has been effected without expense of any kind to the local authorities, from your having kindly placed a gang of prisoners at my disposal: after the rains I hope with their assistance to carry out the remaining portion of the way to Dhar, and then commence upon the line to Ali Rajpoor.

The repair of this road will greatly facilitate the trade on this side, between Malwa and Guzerat. The Custom House Returns at Rajghur shew that nearly 1,600 large carts, of 8 bullocks and upwards, annually pass this way.

The little I have done with regard to repairing the Ghaut at Tirla not only gave employment to the Bheels residing in its vicinity at the trifling outlay of 100 rupees, but enables carts now to pass without any delay or hindrance, and saves a day,—no slight consideration to traders, and which they duly appreciate.

I hope during the ensuing season to be able to make the route to the extent of my limits at Chandpore, a distance of 60 miles: the nature of the soil, being hard and sandy, is most favorable towards it, and I calculate upon assistance from the local authorities to the extent of their power, as they have an interest in the undertaking.

A good deal has already been done in furtherance of this object during the past year: the banks of the Hutnee river have been sloped, the jungle for many miles on the road to Boreghur and Ali Rajpore have been cleared, and a Dhurrumsallah and well constructed at the former place for the accommodation of travellers: a few Bunneahs have also taken up their abode there.

The saving of another day has also been effected by opening the long disused road from Boreghur to Chandpore, and thus obviating the necessity of going round via Rajpore.

Besides the Tirla Ghaut to Ali Rajpore, there are the undermentioned Ghauts, viz., Bhyroo Ghaut leading to Tanda Baug, the Tandla Pitlawud Ghaut, the Jamlie Bulwarie Ghaut to Gunwanie, and the Kuchowada Ghaut to Munnawur.

The Bhyroo Ghaut is in very good order, but rather steep and narrow for any but country carts: so is the Tandla and Pitlawud Ghaut: the other two are almost impassable for carts, and are chiefly traversed by Brinjaree cattle.

With respect to the common cross country roads, above and below the Ghauts, they remain in very good order, and require little repair: they are all practicable for a buggy in the dry season.

The principal road which requires making and metalling, is the one I have mentioned, from Indore to Dhar via Bhopawur to Ali Rajpore. When this is finished, we shall have done some good to this part of the country with respect to an efficient road.

I have, &c.,

(Signed) D. WILKIE, *B. A., in charge Political duties, Bhopawur.*

BHOPAWUR AGENCY, *3rd July*, 1849.

(True Copy.) (Signed) W. F. EDEN, *1st Assistant to Resident.*

(Copy.) No. 45 of 1849.

From Lieutenant R. L. TAYLOR, *Deputy Bheel Agent.*

To R. N. C. HAMILTON, Esquire, *Resident Indore.*

DATED MANPOOR, 3*rd July*, 1849.

SIR,—In reply to your letter, No. 765, I have the honor to annex information relative to the roads under this agency.

From	To	Distance M.	F.	Y	ds.	Remarks.
Diktan	Seerpore..... ...	11	1		24	River Kharum and 10 nullas, some very bad.
Seerpore	Phoottulao.. ...	2	4		124	Falls into main road, 2 nullas.
Seerpore.	Manpore.....	2	5		186	Do. do. do. here.
Manpore.....	Kuneria.....	5	0		170	1 stone river and 6 nullas, one of these extremely rough.

The Diktan road was begun by Lieutenant Evans, with the object of saving Opium merchants principally the circuitous roads formerly travelled; and that from Manpoor to Kuneria was through a dense jungle, so rough that bullocks &c. from Nimar met with many obstacles, and were often induced to go round by Goojree. A small road twelve feet wide has been opened out: there are no ghats or bridges on either line, and the expenses for all have been taken out of the 10 per cent Fund.

I have &c. (Signed) R. L. TAYLOR, *Deputy Bheel Agent.*

MANPORE, 3*rd July*, 1849.

(True Copy) (Signed) W. F. EDEN, 1*st Assist. to Resident.*

Memorandum for Captain Eden.

On Captain Eden's return from Dhoolia, I shall be obliged by his particularly remarking on the state and condition of the Road from Dhoolia to Sindwah; whether it is sufficiently drained to be passable during heavy rain, whether provision is made to cross the dawks or travellers at all the nullahs, and whether, from the absence of the means of transport, the transit of the mails up and down the road is delayed.

2. I should like to have a more precise report on the present condition of the road between Scindwah and the Nerbudda, whether the jungle is cut away, and the road laid bare and clear between Julwarrah and Sindwah about Balsamund, and how it is about Tikree and Koorumpore.

3. Whether the Gohur nuddie has its banks well sloped, and if the stream is said to rise so as to delay or impede crossing.

4. There is another nullah near to Akberpore, which was very bad.

5. Is the road above or below the level of the country generally ? Is it properly and clearly marked out and defined ? Has anything been done towards draining the surface ? Is it generally over black soil, and what may be the general character of the road, as to directness of line and facilities for passengers and vehicles ?

6. I should like particularly to know whether the crossing of the river at the Nerbudda has been properly provided for; whether the boats are good, easy to get into and out by cattle, and sufficient in numbers ?

7. From the Nerbudda to the top of Kilner ghaut, is the road defined ?—has it ever been cleared and distinctly laid down ?—is it above the level of the country, or does the roadway serve as the common drain ?

8. What is the condition of the ghaut itself ? is it metalled ? does the metalling stand, or is it cut into and hollowed by rain ? Is sufficient waterway allowed in the covered drains ? Do the sides where the road has been excavated fall in from want of sufficient slope ? Have there been any landslips, and is the road easy for cattle or vehicles in *the rains ?*

9. From Manpore to Mhow, what is the state of the road ? Is it defined, or is it an irregular track ? and are any nullahs likely to obstruct transit ?

10. From Mhow to Indore, what is the state of the road, and the provision for crossing mails at the nullahs ?

11. Are the bungalows in good order, and have they any, and what, establishments ?

(Signed) R. N. C. HAMILTON, *Resident.*

(True Copy) (Signed) W. F. EDEN, *1st Assistant Resident.*

Observations on the state and condition of the Road from Dhoolia to Indore, made by the orders of the Resident of Indore.

The road from *Dhoolia* to about five miles on this side Soneghur, is sufficiently drained and raised to be passable in heavy rain. Thence to the Taptee, some ten or twelve miles, it is over black soil, for the most part "ditched," indifferently drained and scarcely passable during heavy rain. The approaches to the *Taptee* on both banks are good. From the *Taptee* to *Seerpore*, five or six miles, it is, with the exception of a very

small portion where the ground is high and soil yellow, very bad, and ill drained. Just after I had crossed the river, the rain fell heavily for an hour: I made two attempts to push on to the *Seerpore* bungalow, but without success, owing entirely to the mud, which was deep and stiff—neither palanqueen-bearers nor bullocks could get through it. I was compelled to return to the village, on the bank of the river, for the night, reaching Seerpore, after considerable difficulty and delay, the next day.

2. From *Seerpore* to *Palasnair*, about 17 miles, the first part badly drained. I found the first part of the road, soon after leaving the bungalow, knee deep in water for some 200 yards; the rest of the road undulating and tolerably hard and good, till within two miles of Palasnair, whence the road was very muddy, and passable for vehicles only with difficulty. From Palasnair to the top of the Sindwah ghaut, it is good: the jungle has been well cleared on both sides.

3. From the ghaut to the Sindwah bungalow, except for the first mile or so, the road is very tolerable in wet weather: the jungle has been cut and cleared, and the road being better defined. The jungle has not been so well cleared between *Sindwah* and *Julwarrah*, between which portions of the road on the black soil were very bad. The banks of the *Gohur* or *Goi* river are well sloped: it rises to a great height, totally preventing dawks, travellers, &c., crossing for many hours. There are one or two steep nullahs between Sindwah and Julwarrah, which must in the rains cause some impediment to the mails.

4. The nullah at *Julwarrah* is narrow and rapid, and soon rises; I saw some carts detained by it for several hours. The jungle is cleared about Balsanund: it is clear and open at and about *Teekree*, and tolerably so at *Koorunpoora*. Other portions between them not cut or cleared at all. Much mud between Sangwee and *Koorunpoora*, and between *Koorunpoora* and Teekree, the road, in the latter part especially, lower than the general run of the country, and not drained.

5. At *Thar* is the *Deeb* river, and at *Teekree* the *Bokrar*. I reached it whilst it was rising, and was just able to cross; my servants were delayed a considerable time. From *Teekree* to *Ackberpore* the road is harder for some distance; portions of it over black soil. The Sattruck nullah, about a mile south of Akberpore, is very bad: its approaches require sloping much; it is deep and rapid. The crossing of the Nurbudda seems to be well provided for: there are two or three large boats, and some five or six of a smaller size, all in good order; and those for the

transport of heavy baggage, carriage and cattle, well arranged. From the Nurbudda to Kilner's ghaut, the road is defined. It was, I believe, laid down afresh in 1847; but black soil only thrown on it dug from the side ditches, the first three or four miles, to *Dhumnode*, is execrable, deep black soil, and level with the country. A nullah near Dhumnode is *utterly* impassable for vehicles or cattle in the rains: the mud—and there had been no rain for two or three days—was considerably above the knee; it was crossed by the carriage cattle with me at a part off the direct road, and than only when a firmer footing could be obtained by laying down branches of trees &c.

6. The ghauts *Bickaneer* and *Gharra* are for the most part in excellent order. In some slopes of the former, I observed the metalling had not stood, but had been much cut into or washed away by the rains. There had been a trifling landslip from the side slope on the top of this ghaut: the earth, and stones of considerable size, were lying on the road when I passed.

7. From Maunpore to Mhow, the road is very indifferent. It is generally defined: from the Chumbul to the dawk station, about four miles, it is continuous black soil not drained, and one of several nullahs is deep, and must, when filled, delay the dawks. It is muddy about Plassey also.

8. From Mhow to Rhow it is very bad and ill drained, passing mostly over black soil. From Rhow to Indore it is very good, with the exception of 2 or 300 yards near Beejulpore: the approaches to the nullah on this side Beejulpore are very good, but the bed of that near Indore is muddy.

9. The bungalows are in very good order: a Chuprassee or sepoy is attached to all those up to Ackberpore, whence towards Agra there is a table attendant at each bungalow,—a great convenience to many travellers, since the peon's services are limited to the procuring supplies &c.

10. *Generally speaking*, the road is not below the level of the surrounding country; it has been defined clearly and properly: but the lines now in some places are nearly obliterated,—in others quite so.

11. Little or nothing has been done to drain it, except here and there. It runs chiefly over black soil. Out of the 42 miles from Sindwah to Ackberpore, more than half is on black soil, though not very deep or stiff near *Teekree Bursallai*, and between *Than* and *Julwarra*. The line is direct, decidedly impassable for vehicles in the rains, but good

in fair weather, with common repairs, which it appears not to have had for two or three years.

12. With regard to provisions for crossing the mails over rivers and nullahs, I give the names of some of them, where the absence of the means of transport must cause very considerable delay.

13. At Dhoolia, the *Pangree* is broad and very rapid: no boats—the mails are taken over on a *charpai* or *cot*, supported on gourds. I was detained 18 hours here, and then was obliged to cross on an elephant. On the Taptee there are two large, but seemingly very old, boats, for cattle carriage and passengers, besides a Government mail boat. Close to Seepree, is a river, I think the Kooroond—broad: the water subsides after a while, but there is nothing whatever here or at Kurroond Baree, three miles from Seerpore, (where it is crossed I think again) for the conveyance of the dawk across. Its the same the whole way to Mhow—no arrangements whatever to cross the dawks over rivers or nullahs when in flood. There are the *Deeb*, *Bookrar*, and *Gohur* rivers, the *Julwarrah* nullah, the *Sathook* nullah, the *Karun* near Goojree, the *Chumul* near Maunpore, besides the many deep and rapid nullahs which are met with along the whole distance.

1st July, 1849. (Signed) W. F. EDEN, *1st Assistant to Resident.*

(True Copy) (Signed) W. F. EDEN, *1st Assistant to Resident.*

(True Copies) J. G. LUMSDEN, *Secretary to Government.*

ART XI.—*An Outline of the Somauli Language, with Vocabulary.* By Lieut. C. P. RIGBY, 16th Regiment Bo. N. I.

[Presented by the Author.]

THE country inhabited by the Somal is very extensive: they occupy the whole tract of country, from Cape Guardafui and several degrees to the South of it, nearly as far up as Cape Babelmandeb. Its extent into the interior has not been ascertained, but according to the accounts of the Somal it is very considerable: it is bounded on the North by the Affer or Danākil and Ittoo Gallas, and on the South by the Sowahil. Until lately the Somal have had very little intercourse with Europeans, its few ships visit their coast, but a very considerable trade is carried on between their country and the different Ports of the Red Sea, Persian Gulph, Muscat, and Cutch. The great fair at Berbera continues about six

months annually, viz., from October to April, during the hot season, the people all retire to the high land. The Caravans which come to Berbera are from Hurrur, the country of the Wogadeen and Dúlbanta Somal, Bertéra, and Gabriel-a-Búkr: they bring Coffee, Ivory, Gum Arabic, Myrrh, Frankincense, Aloes, Ostrich feathers, Ghee, various Gums, and Slaves: these they exchange for Dates, Rice, Iron, Tin, Lead, Glass beads, Cotton and Silk cloths, Satins, and Tobacco. A great portion of the produce of the Somauli country is afterwards reshipped from Mocha, Mascat &c., to the Indian and English Markets: the Coffee, especially that of Hurrur, is considered superior to that of Mocha, and fetches a higher price. The Somal are peculiarly a trading people, and from the increasing intercourse with the English which has sprung up since we have been in possession of Aden, it is likely that the resources of that part of Africa inhabited by them, will soon be more fully developed, and offer an advantageous market for the introduction of British goods. The number of Slaves annually exported from Berbera, is between six and 700: they are chiefly natives of Gúragué, the Shangalla, and various Galla tribes: they are purchased by the vessels from the Persian Gulph for the Mascat and Bussora markets. According to the Somal, the Slave trade has greatly diminished of late years, as formerly the number annually exported amounted to between two and 3000: the price varies from 25 to 35 dollars for boys, and from 80 to 120 dollars for girls, but if good-looking, they frequently fetch a much higher price. Many of the Slave Merchants are Danakil who reside at Tajurra: they purchase the Slaves from Efat and the country of the Wello Galla, and take them to Berbera for sale, as offering a better market than at Tajurra. The trade at Berbera is carried on principally through the agency of Banians and Merchants from the Red Sea, a number of whom always reside there during the period of the fair. Since the occupation of Aden by the English, the Somaulies have continued to cross over in considerable numbers and furnish the chief supply of sheep, ghee, &c.; many of them have become permanent settlers in Aden, and appear rapidly to improve in their habits and condition. In person, the Somal are generally tall and well limbed, with a dark smooth skin, very white teeth, and fine expressive features, having neither the dull unpleasing features of the Sowahil who border them on the South, nor the wild savage looks of their Northern neighbours the Danakil, from whom they equally differ in character and language. They have none of the characteristic features of the Negro, whom they despise, and consider the name a term of reproach. They in

general have long curly hair, which they dye, with chunam and a kind of red earth, a deep red, and draw it out into small ringlets all over the head. Those among them who have distinguished themselves by killing an enemy in battle, or an elephant, or lion, wear an ostrich feather, stuck upright in the crown of the head, and an ivory ring round the upper part of the right arm. They are very fond of wearing charms and amulets, which are generally made of silver, or a small leather bag containing sentences from the koran and hung round the neck or worn round the right arm: they consider them very efficacious in warding off disease, and preserving them from enemies. The dress of the men consists of a single white cloth wrapt loosely round the body, and the end thrown over the left shoulder; that of the women consists in like manner of a single cloth bound round the waist, and both ends fastened in a knot across the breasts; but many of the poorer people of both sexes are clothed entirely in leather made of sheepskins, and worn in the same manner. Those who are employed in ships generally adopt the Arab dress while absent from their own country. The women are in general very stout, and form a great contrast to the slender figures of the men. When young, they are generally very good-looking, with regular features: they are not under any peculiar restraint in the presence of the men, but always free and cheerful; they are exceedingly industrious, and usually occupied the whole day in making different kinds of mats from the leaves of the doom-palm: they attend to all the drudgery of the house, and, different from most other classes of Musselman females, are very regular in their daily public prayers. The unmarried girls wear their hair in small ringlets hanging loosely all over the head, which has a very becoming appearance: after marriage they draw it tightly over the back of the head, and wear it tied in a bag of network or a black handkerchief. They generally wear large necklaces, called "awdulli," made of pieces of amber, glass beads, and coral. The men do not wear turbans, and generally have two or three small sticks of a species of boxwood bound together upright on the crown of the head, which they use as a comb: some of them also wear large red wigs, made of sheepskin dyed.

The Somal have an inherent hatred of the Arabs, and it would therefore not be prudent for a person travelling in their country to assume that character. They are bigoted Musselmen, and very particular in the observance of their daily prayers. They observe the same festivals and fasts as the Arabs, with the exception of the Dúbshid or New Year's

Day, which they celebrate with bonfires and feasting. They attach great importance to the rite of circumcision, and appear to think it the principal ordinance of their religion ; they perform it generally between the ages of four and eight years. A very singular custom prevails among the Somal, and one that I have never heard of as existing in any other country. " Hac in gente ad castitatem, servandam hujus modi-mos est. Puellarum vulvas filo ex corio confecto constringunt ; has cum connubiale jugum ferre poterint, magno cum apparatu solvunt."

The Somal ascribe their origin to three persons, viz. Isacc, Tir, and Tarood, the former of whom, according to their tradictions, emigrated from the Hadramaut to Med on the African Coast, from which place his descendants separated and established themselves in Hais, Aramadi, Angúr, Kúrm, Andúrad, Berbera, and Zeilah, having possessed themselves of the country from the Gallas, who they say originally inhabited all the country now possessed by the Somal. From Isacc they say originated three tribes ; viz. Hŭbr Gājis, Hŭbr Awŭl, and Hŭbr tul Jailah. These afterwards became divided as follows :—the Hŭbr Gājis into three tribes, viz. Aúbr a Bŭkr, Aŭbr Yonis, and Aŭrb : the Hubr Awul into three tribes, viz. Issa Mússa, Saād Mússa, and Gabriel Mússa : and the Hŭbr túl Jailah into three tribes, viz. Mússa Búkr, Mahomed a Bŭkr, and Sumbur : these are now subdivided into numerous inferior tribes, of whom may be mentioned the Isacc Hurrar, Mussa Hurrar, Ismael Húrrar, and Gúmba Hurrar, branches of the Hŭbr Yonis, and inhabiting Med and Aramadi : the Hŭbr Nooh, and its branches the Eiyal Hosh, Eiyal Gedeed, Eiyal Shertown, and Eiyal Mahmoud, who occupy Berbera and the surrounding country : the Yesiff and Adam Madoba branches of the Hŭbr túl Jailah, who occupy Kurm, and Hais. Of the origin of Tir they have no account : from him sprang six tribes, viz. the Gabrael, Rerdod, Túrre, Huge Selubbe, Abdullah Hassan, and Madigan: they occupy the Sea Coast to the South of Berbera, and are represented as few in numbers and much poorer than the other tribes.

Tarood, according to their traditions, came originally from the country of the Sowahil, and was a slave ; but as Tarood is an Arabic word (from the root طَرُدَ signifying the banished, or expelled, it is probable that he came from some part of Arabia, and acquired the name from having been banished from the country, or was a name assumed by some tribe who, having left their native country, settled on that part of the African Coast now inhabited by them. From Tarood they say originated four tribes, whom the other Somaulies still look upon as of

Sowahili or Negro origin. They are Majerteen, Wŭrsungulli, Dholbanta, and the Wogadeen: which are also sub-divided into numerous branches. The Majerteen occupy the country bordering on the Sowahil, called Alolo, Habo, Kurso, Kesulli, Mudaiyo, which is the residence of their Súltan, and Bosaso. The Dholbanta and Wogadeen, which are two of the most powerful tribes of Somal, occupy the country to the North, bordering on the Galla country and near Hurrur: they are considered a wild barbarous race by the other Somal: their country produces myrrh, ivory, ghee, corn, and sheep. The Wŭrsungulli are a very numerous tribe: their country is called Bōsaso, and Laskorai, adjoining the country of the Majerteen to the South of Berbera. Their country produces frankincense, wood, and the doom tree, from the leaves of which they make mats. Each tribe is perfectly independent; they have frequent disputes and battles with each other, but would doubtless unite for a common cause: their arms consist of two light spears about six feet in length, a shield made of rhinoceros or ibex hide, a straight dagger, and a bow, and arrows poisoned with the juice of a tree called gergaleh. Fire-arms and ammunition are scarce among them. The Hŭbr Gajis tribe and its different branches are governed by two Sultans, named Sultan Deriah and Sultan Farah: the residence of the latter is at Toro, but according to the Somal, their authority is little more than nominal. The Hŭbr tul Jailah have no Sultan or government of any kind. Hubr in the Somauli language signifies mother; a tribe is called tul. Their chief wealth consists in cattte and sheep, upon the produce of which they principally depend for their subsistence: many of the tribes lead a wandering unsettled life, moving about for the convenience of pasturage. Their principal amusement is dancing: they have no musical instrument, but beat time with a loud clapping of hands. They are restrained by no laws. If a man kills another belonging to a different tribe, the relations of the murdered man demand that the murderer be given up to them to be put to death, or they demand a supposed equivalent in cattle,—usually one hundred female camels, or three or four hundred sheep and a few cows: if, however, they refuse to give up the murderer, or make any reparation, war is sure to ensue between the two tribes. If a Somaulie kills another of his own tribe, he is either put to death by the men of his own tribe, or if the relations of the murdered man are willing, the murderer is made to pay an equivalent in cattle.

They generally marry between the ages of 15 and 20 years. When a man is desirous of marrying, his friends apply to the parents or nearest

relatives of the girl whom he wishes to marry, and if their consent be obtained, the girl is seldom consulted on the subject. They next arrange the marriage portion which the young man is to pay, which is generally about 50 sheep, or a few camels or cows when in their own country, or among those residing at Aden or Mocha from 20 to 25 dollars, according to the custom of the Arabs. The girl is not expected to bring anything. A man can divorce his wife whenever he chooses, and it is very commonly done. If the husband finds cause to doubt the chastity of his wife, the morning after the marriage he digs a hole before his door and covers it over with a piece of mat, or tears the skirt of his garment, whereby the relations of the woman become disgraced.

Polygamy is very common among them, but the women are not secluded as in most Mahomedan countries.

Their huts, which are constructed in the shape of the Wigwams of the American Indians, are made of leaves and covered with skins or mats : their furniture generally consists of a mat couch, a few brass or earthen cooking utensils, large jars for holding milk, and carpets made of kid-skins sewn together. They are very temperate people : the use of spirituous liquors, or booza, so common umong the Abyssinians and Danakil, is almost entirely unknown among them. In disposition they appear contented and good natured. When a man dies, his property is divided among the children : the daughters, however, if there be any, receive only a small portion. The widow either marries one of her former husband's relations, or returns to her own family. When a man dies leaving no children, his widow receives no share of his property, which is divided amongst his nearest male relations,—one of whom however generally marries her.

Strangers visiting the Somauli country are obliged to engage a person called " Aban," who becomes responsible for their security during their residence in the country, and acts as Broker, Agent and Interpreter : they expect no stated sum as pay, but are remunerated by a per centage from the merchants and a present from others. So general is this custom that even the Danakil and merchants from the Red Sea, who visit Berbera every year, are obliged to conform to it ; if a person after having engaged an "Aban" is robbed or ill-treated, the tribe to which the " Aban" belongs, consider themselves bound to take up his cause and see justice done : but so strictly are strangers protected after engaging an " Aban,"

that they say no instance has ever occurred of a person being ill-treated after having engaged one.

The Somal, according to their own account, were converted to the Mahomedan religion, without any bloodshed or strife, by a messenger from Umr, one of the chiefs of the Koreish tribe.

The same custom of female circumcision prevails among the Somal as among the Abyssinians, and if their own account of their Arabian origin can be relied on, it is possible that they are descended from the Abyssinians, who about a century before the birth of Mahomed invaded Yemen : although the Somal themselves have no traditions to favour this theory, yet they do not consider themselves the original inhabitants of the country they now occupy, and they equally differ in character and features from the Arabs as from the nations by which they are surrounded.

ADEN, *25th November*, 1841. C. P. RIGBY.

THE Somaulies are entirely ignorant of the origin of their language : it bears not the slightest resemblance to the Amharic, Dankali or Galla languages, either in construction or pronunciation, and possesses very few words in common with them : a great many Arabic words have been introduced into it, but it has not the slightest similarity to that language, in construction. The Somaulies themselves know of no grammatical rules for the formation of words, but their language appears to be much more regular than might be expected from their not possessing any written character. The Somaulies always make use of the Arabic character in writing—the words, however, can be much more correctly expressed by the English character : they pronounce the words with a strong nervous accent, and, unlike the Arabs, have no gutteral sounds.

The numerous tribes of Somaulies have one common language, differing but little in pronunciation : most of those who have intercouse with the Arabs, know the Arabic language, but to any person travelling inland, a knowledge of the Somaulie language might be useful. I have in the following pages given all the rules with which I have become acquainted, and although I have no doubt that it is still very imperfect, yet I hope that it contains enough to be useful to any person wishing to travel in the yet unexplored country inhabited by the Somal, a people who, to judge from their character, would offer no opposition or injury to a traveller.

Pronunciation of the Letters and the Article.

The letters with very few exceptions are pronounced the same as in English: but the distinction of sound between two letters is frequently so slight as to be almost imperceptible, and they are therefore used without distinction, as dŭb or dŭp, fire; k or g, as aneka or anega, I.; d or r, as gŭd or gūr, the beard, fudiso or furiso, sit down: ŭ is pronounced as in burn, turn, run: ū is pronounced as in use, or oo in good: d as in English: d as the Arabic pronunciation of ذ ض or ظ a sound which cannot be correctly expressed by English characters, but between z and th or dh.

The article in Somauli is expressed by ka, ki or ga, gi,—as furus, a horse; furuska, the horse; agul, a house; agulka, the house; nin, a man; ninki, the man; mindi, a knife; mindida, the knife; dŭr, cloth; dŭrka, the cloth: ka is also used to express *than*, but it is then generally placed next before the verb, as, I am taller than him, aneka husuggu ka deri: or to express *from*, as—where have you come from? adeka hugi ka temid?

The words in the Vocabulary opposite to the English Infinitives, are not intended to express the sense of an Infinitive, but merely as in Arabic, to shew the root or word from which all others of that signification are derived.

All the words in the Vocabulary of Arabic or Amharic origin I have marked as such, although it will be seen they have often a very vitiated pronunciation in the Somauli.

The Noun Substantive.

Nouns have two genders, Masculine and Feminine: and two numbers, singular and plural; they have no regular variety of termination corresponding with the cases of other languages, and frequently no word or termination is added, when of, from, to, or with, are intended to be expressed: thus jidki is used whether it be intended to express of, from, in, or to, the road: there is no difference of termination to distinguish Masculine from Feminine Nouns, and both genders are common to inanimate things; as maghalo, a city or country (fem.), ged, a tree (masc.), mindi, a knife (fem.), bilawa, a dagger (masc.): the plural has several different terminations, but that ending in ō or ū is the most common: n in the singular is always changed to m in the plural, as adin, a foot,

plural adimo, feet; nin, a man; nimun, men; wŭrn, a spear; wurmo, spears: gashan, a shield; gashamo, shields. Animals of different sexes have generally different names, as furus a horse; gehyen a mare; dibi a bull, sa-ah a cow; awŭr a male camel; hŭb a female camel; wil a son; ghubr a daughter; or they are distinguished by the words lŭb male, or didig female: as libah lub, a male lion; libah didiga, a lioness; áé lub, a dog; ae didig, a bitch: the instrumental case is expressed by ba, ga: the dative by durardi: the locative by ha, du, ga; the ablative by ka or kai, as in the following example:—

Singular.	*Plural.*
Nom. A spear, wŭrn.	Spears, wŭrmo.
Gen. Of a spear, wŭrnka. [wŭrnba.	Of spears, wŭrmoha.
Instrumental. By, or with a spear,	By or with spears, wŭrmoba.
Dative, To or for a spear, wŭrn durardi.	To or for spears, wurmo durardi.
Locative. In a spear, wŭrnku.	In spears, wurmohu.
Voc. O spear, wŭrn yaho.	O spears, wurmo yaho.
Ablative. From a spear, wŭrnka.	From spears, wurmoha.

Examples.—He killed him with a spear, husuggu wŭrnba laku dillai; I came from my house, aneka agul kaigi ka emid; he came for a knife, husuggu mindi durardi emid:—

The following examples are intended to shew the different formations of the plural.

Singular.	*Plural.*
A Hill, Bor.	Hills, Boro.
A Stone, Dagha.	Stones, Daghayo.
A River, Dŭrdŭr.	Rivers, Dŭrdŭro.
A Camel, Awur.	Camels, Awro.
A Woman, Nag.	Women, Nago.
A Slave, Bidah.	Slaves, Bidod.
A Month Bil.	Months, Bilod.
The Hand, Gan.	Hands, Gamu.
A Knife, Mindi.	Knives, Mindiyo.
A Brother, Wilal.	Brothers, Wilalo.
A Day, Dŭrar.	Days, Dŭrarod.
A Night, Hŭben.	Nights, Hŭbeno.
A Foot, Adin.	Feet, Adimo.
A Fowl, Dorah.	Fowls, Dorayal.
A Bow, Kansŭ.	Bows, Kansoin.
A Dagger, Bilawa.	Daggers, Bilawayal.
A Road, Jid.	Roads, Jidŭd.

Examples.—I will go after four months, aneka afarr bilod dubeded wa taghaya.

I saw him three days ago, aneka sadah duraro hurtod husuggu arkai.

He possesses many slaves, husuggu bidod budun bu leyahai.

The knives are mine, mindiyo aneka alch.

The singular is generally used instead of the plural when any number is specified, as tobun dorah, ten fowls, instead of tobun dorayal : shun nin, five men, for shun nimun : four fish, afarr kŭlon, for afarr kŭlomo.

Adjectives.

The Adjectives in Somauli are very simple,—they have no separate terminations of gender, and no cases : in construction, they are always placed after the substantives, as—a good man, nin wa nuksun : a large house, agul wēn ; a small knife, mindi yer.

Attributive Adjectives generally end in aiya or ahai in the singular, and ahin or aiyahin in the plural, as, this is cheap, wahas wa jubayahai ; these are cheap, wahasu wa jubayahin ; this is dear, wahas wa adŭktahai ; these are dear, wahasu wa adŭkyahin ; he is deaf, husuggu wa dagholaya; they are deaf, aigu wa dagholayahin ; they are good, wahasu wa nuksayahin. The Adjectives have not any regular degrees of comparison ; the comparative degree is generally expressed by ka, as this is better than that, wahas waha ka wa nuksun : he is taller than thee, husuggu hūka der : thou art worse than him, adeka husuggu ka hūmid. The superlative degree is always formed by the word kawida being placed before the Adjective, as, the best of all, kawida wa nuksun ; the largest of all, kawida wen ; the smallest of all, kawida yer ; the most excellent of men, dŭdka kawida wa nŭksun. Wa is frequently placed before Adjectives and Verbs: it appears to have no precise meaning, unless it be to give force to an assertion, as, I did see, aneka wa arkai ; I did go, aneka wa tŭghai : he is good, husuggu wa nuksun.

The Adjectives generally form the plural in yehin, or an ; if the singular terminates in n, that letter is generally dropped in the plural, as nuksun, good, plural nuksayehin ; or is changed into s, as asan, red, plural asasyehin.

Cardinal Numbers.

1 One, kau, or mid.
2 Two, lŭbah.
3 Three, sadah.
4 Four, afarr.
5 Five, shun.
6 Six, liyah.
7 Seven, tudobah.
8 Eight, sided.
9 Nine, sŭgal.
10 Ten, tobun.
11 Eleven, kaubi ya taubun.
12 Twelve, lubah ya tobun.
13 Thirteen, sadah ya tobun.
14 Fourteen, afarr ya tobun.
15 Fifteen, shun ya tobun.
16 Sixteen, liyah ya tobun.
17 Seventeen, tudobah ya tobun
18 Eighteen, sided ya tobun.
19 Nineteen, sŭgal ya tobun.
20 Twenty, lŭbahtun.
21 Twenty-one, kaubi ya lubahtun.
22 Twenty-two, lubah ya lubatun.
23 Twenty-three, sŭdah ya lubahtun.
24 Twenty-four, afarr ya lubahtun.
25 Twenty-five, shun ya lubahtun.
26 Twenty-six, liyah ya lubahtun.
27 Twenty-seven, tudobah ya lubahtun.
28 Twenty-eight, sided ya lubahtun.
29 Twenty-nine, sugal ya lubahtun.
30 Thirty, sudun.
31 Thirty-one, kaubi ya sudun.
32 Thirty-two, lubah ya sŭdŭn.
33 Thirty-three, sadah ya sudun.
34 Thirty-four, afarr ya sudun.
35 Thirty-five, shun ya sudun.
40 Forty, afarrtun.
41 Forty-one, kaubi ya afarrtun.
42 Forty-two, lubah ya afarrtun.
50 Fifty, kuntun.
51 Fifty-one, kaubi ya kuntun.
52 Fifty-two, labah ya kuntun.
60 Sixty, liyahdun.
61 Sixty-one, kaubi ya liyahtun.
70 Seventy, tudobahtun.
71 Seventy-one, kaubi ya tudobahtun.
80 Eighty, sidedtun.
81 Eighty-one, kaubi ya sidedtun.
90 Ninety, sugashun.
91 Ninety-one, kaubi ya sugashun.
92 Ninety-two, lubah ya sugashun.
93 Ninety-three, sadah ya sugashun.
100 One hundred, bŭghl.
105 One hundred and five, bughl ya shun.
150 One hundred and fifty, bughl ya kuntun.
200 Two hundred, luba bughl.
250 Two hundred and fifty, lubah bughl ya kuntun.
300 Three hundred, sadah bughl.
400 Four hundred, afarr bughl.
500 Five hundred, shun bughl.
1000 One thousand, kŭn.
10,000 Ten thousand, tobun kŭn.

Note.—Ya signifies and.

Ordinal Numbers.

First, kouda.
Second, lubahda.
Third, sadahda.
Fourth, afarrta.
Fifth, shunta.
Sixth, liyahda.

Seventh, tudobahda.
Eighth, sidedah.
Ninth, sugalka.
Tenth, tobnadka.
Eleventh, koubi ya tobnadka.
Twelfth, lubah ya tobnadka.
Thirteenth, sadah ya tobnadka.
Fourteenth, afarr ya tobnadka.
Fifteenth, shun ya tobnadka.
Sixteenth, liyah ya tobnadka.
Seventeenth, tudobah ya tobnadka.
Eighteenth, sided ya tobnadka.
Nineteenth, sugal ya tobnadka.
Twentieth, lubatunka.
Twenty-first, kaubi ya lubatunka.
Twenty-second, lubah ya lubatunka.
Thirtieth, sudunadka.
Thirty first, kaubi ya sudunadka.
Fortieth, afarrtunadka.
Fiftieth, kuntunaka.
Sixtieth, liyahdunadka.
Seventieth, tudobahtunka.
Hundredth, bŭghladka.
Thousandth, kŭmunka.

Fractional Numbers.

¼ One quarter, wah.
½ A half, bud.
¾ Three quarters, sadah wahod.
1¼ One & a quarter, mid ya wah.
1½ One & a half, mid ya bud.
2½ Two and a half, lubah ya bud.
3¼ Three and a quarter, sadah ya wah.
3¾ Three and three quarters, sadah ya sadah wahod.

The Ordinals have the same terminations for both genders,—as, the third man, ninka sadahda: the fifth woman, nagti shunta; the twelfth night, hubenki lubah ya tobnadka: the fifteenth day, wagi shunya tobnadka.

Pronouns.

The Pronouns in Somauli are separate, affixed and prefixed: the affixed pronouns are attached to nouns, and are so numerous and vary so much that it is impossible to lay down any certain rules for their formation; the affixed pronouns are attached only to verbs.

Separate Personal Pronouns.

Singular.	*Plural.*
1st Pers.—I, aneka or anega, ana.	We, anaka or anaga.
2nd Pers.—Thou, adeka or adega.	Ye, idinka, or adinka.
3rd Pers.—He, husugga.	They, aiga or aika.
Singular.—She, aiza: or aida.	Feminine, the same.

These Pronouns are the same for both genders, and have no difference of cases.

Possessive Pronouns.

The Possessive Pronouns are found affixed to nouns: those used with nouns in the singular number, differ somewhat from those attached to

substantives plural, there appears to be no regular rule for their formation, but they are generally made to agree with the last syllable of the substantive to which they are affixed; those attached to singular nouns are—

Singular.	*Plural.*
1st, My or mine, kaigi, daidi, haigi.	Ours, deni, keni, eni.
2nd, Thy or Thine, kagi, tadi, dadi.	Yours, eni, deni, keni.
3rd, His, kisi, hisi, isi, tisi.	Theirs, hodi, koza, doda.
Her, dedi, edi, kedi.	Feminine, kozi, gozi.

Examples.—Thy house, agulkagi; thy knife, mindi dada; my country, mughala daidi; my ship, donah daidi; his dagger, bilawahisi; his house, agut kisi; your horse, furuskeni; our house, agut keni.

Possessive Pronouns used with Substantives in the Plural number.

Singular.	*Plural.*
1st, Daida, haiga, kaigi.	1st. Haiyagi, daiyadi, taiyadi.
2nd, Haga, dada, kaga.	2nd, Heni, deni, teni.
3rd, Isi	3rd, Todi, dodi, hodi.
Feminine, dedi, kedi.	Feminine, dodi, hodi.

Examples.—Thy houses, agulladada; thy knives, mindiyahaga: my spears, wurmu haiga: my boats, doneah haiga; our houses, agalla dayadi; our books, kitaba tayadi; our horses, furda hayagi; their hands, ghama haigi.

Prefixed Pronouns.

The Prefixed Pronouns are used only with verbs; they represent the accusative case; there is no prefixed pronoun of the third person, and the pronoun of the second person is frequently used to express it.

Singular.	*Plural.*
1st Person, ai, aiku; accus. ē.	1st, Nă, năgu.
2nd Person, kū, kûgū.	2nd, ēden, ēdenku.
3rd ———	———

Singular.	*Examples.*	*Plural.*
He saw me, husugga ai arkai.		He saw us, husugga na arkai.
He saw thee, husugga ku arkai.		He saw you, husugga eden arkai.
He saw him, husugga arkai husugga.		He saw them, husugga aruk.
He saw her, husugga arkai aida.		I saw them, aneka arkai.
I saw you, aneka ku arkai.		We saw you, anaga eden arkai.
I saw him, aneka arkai husugga.		You saw us, adinka na arkai.
I have given thee, aneka ku siyi.		We have given thee, anaga ku sinai.
He has given me, husugga ai siyi.		They have given us, aika ai siyi.

I have given him, aneka siyi husugga.	He have given him, anaga sinai.
He will give me, hussuga ai sēn.	They will give me, aika ai sen.
I will give thee, aneka ku sēn.	They will give thee, aika ku sen.
Thou wilt give me, adeka ai sen.	Ye will give me, adinka ai sen.

The Demonstrative Pronouns are the following :—

Sing. This, waha.	Plur. These, was, wahas.
Sing. Fem. tas, das.	Plur. Fem. has.
Sing. That, kas, waka.	Plur. Those, wa kuwa, wa kuwas.

Examples.—Do you want this ?—adeka waha ma donisa ? Do you know this woman ?—adeka nagtas ma takan ? Are these eggs good ?—ugayahas wa nuksayehin ? Behold that man : ninki waka arug. Where are you taking those sheep ?—aragi wa kuwas hugi genisa ?

Interro gative Pronouns.

Who ? Aiyw ? Wahyw ?	What ? maha ? wa mai ?
Of Whom ? Yaleh ?	Of what ? mahu ?
To Whom ? Yan ?	For what ? mehu ?

Possessive Pronouns affixed to a Substantive in the Singular.

My son, wilkaigi.	My camel, awurkaigi.
Thy son, wilkagi.	Thy camel, awurkagi.
His son, wilkisi.	His camel, awurkisi.
Her son, wilkedi.	Her camel, awurkedi.
Our son, wilkeni.	Our camel, awurkeni.
Your son, wilkini.	Your camel, awurkini.
Their son, wilkodi.	Their camel, awurkodi.

Possessive Pronouns affixed to a Substantive in the Plural Number.

My houses, agulladaidi.	My cows, lohdaidi.
Thy houses, agulladadi.	Thy cows, lohdadi.
His houses, agulladisi.	His cows, lohdisi.
Her houses, agulladedi.	Her cows, lohdedi.
Our houses, agulladaiyadi.	Our cows, lohdaiyadi.
Your houses, agulladini.	Your cows, lohdini.
Their houses, agulladodi.	Their cows, lohdodi.

The Reciprocal Pronoun.

This is expressed in Somauli by the word Nŭf, probably a corruption of the Arabic نفس nŭfs. Examples : he killed himself, husugga nuftiá dillai. I love myself, aneka nŭftaidi ja-al.

There are no Relative Pronouns in Somauli, and to express them the Personal Pronouns are used ; as, give to him who comes—husugga emata, sih. The Accusative case of the personal prononal in the 1st person

is ē, as give to me, ēseh. Shew me, etus : kill me, edil. Of the 2nd person the accusative is kūgū, as, I will beat you, aneka kūgū dufunaya. In the 3rd person it is expressed by husuggu, as, give him, husuggu sih ; shew him, husugga tus ; kill him, husuggu dil.

Adverbs.

The following is a table of Adverbs of most common use in the language :—

Here, hulka, mesha.
There, hulko, mesho.
Above, dusha.
Beneath, osta.
Before, horta.
Behind, dubada.
Upon, dusha.
Where ? meha, hŭgoo ?
Whence, hugika.
From above, dusha ka.
From below, osta ka.
Now, aminka.
To-day, manta.
Yesterday, shullai.
To-morrow, beri.
Quickly, duksa.
Slowly, heder.
Daily, wawulba.
Yes, ha waiyahai.
No, maya meha.
How ? wa siddi ?
Why, mahad, mahai.
Very, budun.
Outside, debida.
When, hudmah.
Once, merkelya.
Far, fug.
Below, osta.
Every where, mehal wulba.
Hereafter, dubeded.
After, hortod. [dubeded.
Two days hence, lubah durarod
Two days ago, lubah durarod hurtod.
In the morning, subahdi.
In the evening, mugheibki.
Like, sidda, kulli.
Thus, wa, siddas.
Nothing, wahba.
How much, inmisa.
Truly, warun.
At that moment, kulkas.
Once, merkelya.
Twice, lubah ghorod.
First, tehora.
More, ka budun.
This way, sidas.
Towards the right hand, midikta.
Towards the left hand, bideda.

Conjunctions.

And, ya.
If, adi.
Or, musowa.
Wherefore, wayu.
For, because, durardi.
With, wehla.
From, ka..
Without, kulli.

The Verb.

The Verb in Somauli has four Tenses, corresponding with the Present, Past, Future, and a Conditional ; also an Imperative form, and a Prohibitive : they are mostly very regular, and all the Verbs have nearly the same construction : the Auxiliaries are as follow :—

Present Tense.

Singular.	*Plural.*
I am, aneka wa joga,	We are, anaka wa jogna.
Thou art, adeka wa jogta.	Ye are, adinka wa jogtan.
He or it is, husugga wa joga.	They are, aiga wa jogun.
She is, aida wa jogta.	Fem. the same.

Past Tense.

I was, aneka wa jogai.	We were, anaka wa jognai.
Thou wast, adeka wa jogtai,	Ye were, adinka wa jogten.
He or it was, husugga wa jogai.	They were, aiga wa jogen.
She was, aida wa jogtai.	

Future Tense.

I shall or will be, aneka wa jogi dona.	We will be, anaka wa jogi dona.
Thou wilt be, adeka wa jogi donta.	Ye will be, adinka wa jogi dontan.
He will be, husuggu wa jogi dona.	They will be, aiga wa jogi donan.
She will be, aida wa jogi donta.	

There are no other Tenses of this Verb, but the following "jirrah" is often used, and has nearly the same meaning as "joga," excepting that "jirrah" is more generally used in speaking of inanimate objects.

Present Tense.

Singular.	*Plural.*
I am, aneka wa jirrah.	We are, anaka wa jirrah.
Thou art, adeka wa jirtah.	Ye are, adinka wa jirtan.
He or it is, husugga wa jirra.	They are, aiga wa jirran.
She is, aida wa jirta.	Fem. the same.

Past Tense.

I was, aneka wa jirrai.	We were, anaka wa jirrai.
Thou wast, adeka wa jirtai.	Ye were, adinka wajirten.
He or it was, husugga wa jirrai.	They were, aiga wa jirren.
She was, aida wa jirtai.	

Future Tense.

Singular.	*Plural.*
I shall or will be, aneka wa jirri dono.	He shall or will be, anaka wa jirri dona.
Thou wilt be, adeka wa jirri donta.	Ye will be, adinka wa jirri dontun.
He or it will be, husuggu wa jirri dona.	They will be, aiga wa jirri donan.
She will be, aida wa jirri donta.	

Conditional.

Should I be, adi ana jirro.	Should we be, adi anaka jirro.
Shouldst thou, adi adeka jirtid.	Should ye be, adi adinka jirtan.
Should he be, adi husuggu jirro.	Should they be, adi aigu jirran.
Should she, adi jirtu.	

The Auxiliaries have no Imperative form. The Negative forms are as follow :—

I am not, aneka ma jogin.
Thou art not, akeka ma jogin.
He or it is not, husuggu ma jogin.
She is not, aida ma jogin.
I am not, aneka ma jirren.
Thou art not, adeka ma jirren.
He is not, husuggu ma jirren.
She is not, aida ma jirren.
It is not, ma jirru ma jirtu.

We are not, anaka ma jogin.
Ye are not, adinka ma jogin.
They are not, aigu ma jogin.

We are not, anaka ma jirren.
Ye are not, adinka ma jirren.
They are not, aigu ma jirren.
They are not, inanimate, ma jirtu, ma jirran.

Example of Verbs Conjugated.

Present Tense.

Singular.	*Plural.*
I hear, aneka mugulaya.	We hear, anaka mugulaina.
Thou hearest, adeka muglisa.	Ye hear, adinka mugulaya.
He hears, husuggu mugulaya.	They hear, aiga mugulaya.
She hears, aida muglisa.	

Past Tense.

I heard, aneka muglai.
Thou heardst, adeka mugshai.
He heard, husuggu mugul.
She heard, aida mugshai.

We heard, anaka muglai.
Ye heard, adinka mugshai.
They heard, aiga muglai.

Future Tense.

Singular.	*Plural.*
I shall or will hear, aneka mugli donta.	We shall or will hear, anaka mugli donta.
Thou shalt or will hear, adeka mugli donta.	Ye shall or will hear, adinka mugli donan.
He shall or wilt hear, husugga mugli donta.	They shall or will hear, aiga mugli donan.
She shall or will hear, aida mugli donta.	

Conditional.

If I hear, or should I hear, adi aneka muglu.
If thou hearest, adi adeka mugshu.
If he hears, adi husugga muglo.
If she hears, adi aida mugshu.

If we hear, adi anaka muglu.
If ye hear, adi adinka mugshan.
If they hear, adi aiga muglaṅ.

Imperative.

Hear thou, mŭgl.
Let him hear, ha muglo.

Hear ye, mugla.
Let them hear, ha muglen.

Participles.

Active ; hearing, muglai.

Passive ; heard, muglaya.

Dof—To travel or go to sea.

Present Tense.

I travel, aneka dofaya.
Thou travellest, adeka dofisa.
He travels, husugga dofaya.
She travels, aida dofisa.
We travel, anaka dofena.
Ye travel, adinka dofaya.
They travel, aiga dofaya.

Past Tense.

I travelled, aneka dofai.
Thou didst travel, adeka doftai.
He travelled, husuggu dof.
She travelled, aida doftai.
We travelled, anaka dofuai.
Ye travelled, adinka dofte.
They travelled, aigu dofe.

Future Tense.

I shall or will travel, aneka dofi dona.
Thou wilt travel, adeka dofi donta.
He will travel, husuggu dofi dona.
She will travel, aida dofi donta.
We shall or will travel, anaka dofi dona.
Ye will travel, adinka dofi dontan.
They will travel, aiku dofi donan.

Conditional.

Singular.	*Plural.*
If I travel, adi aneka dofo.	If we travel, adi anaka dofno.
If thou travellest, adi adeka doftid.	If ye travel, adi adinka doftan.
If he travels, adi husuggu dofo.	If they travel, adi aiga dofan.
If she travels, adi aida dofto.	

Imperative.

Travel thou, dof.
Let him travel, ha iskadofo.
Travel ye, adinka dofa.
Let them travel, ha dofen.

Participles.

Travelling, dofaya.
Travelled, dofai.

Kurra—to be able.

I am able, aneka kurra.
Thou art able, adeka kurra.
He is able, husuggu kurra.
She is able, aida kurta.
We are able, anaka kurra.
Ye are able, adinka kurra.
They are able, aika kurra.

Past Tense.

I was able, aneka kurri jerrai.
Thou wast able, adeka kurri jerrai.
He was able, husuggu kurri jerrai.
She was able, aida kurri jirtai.
We were able, anaka kurri jirrai.
Ye were able, adinka kurri jirrai.
They were able, aika kurri jirrai.

Future Tense.

I shall or will be able, aneka kurri dona.
Thou wilt be able, adeka kurri dona.
He will be able, husuggu kurri dona.
She will be able, aida kurri donta.
We will be able, anaka kurri dona.
Ye will be able, adinka kurri dona.
They will be able, aiga kurri dona.

Conditional.

If I am able, adi ana kurro.
If thou art able, adi adeka kurtid.
If he is able, adi husuggu kurro.
If she is able, adi aida kurto.
If we are able, adi anaka kurro.
If ye are able, adi adinka kurtan.
If they are able, adi aigu kurran.

Negative Form of Verbs.

I will not do, aneka fulli mayu.
Thou wilt not do, adeka fulli maisu.
He will not do, husugga fulli mayu.
She will not do, aida fulli maisu.
We will not do, anaka fulli maino.
Ye will not do, adinka fully maisan.
They will not do, aigu fulli mayan.

Present Tense.

I do not know, aneka ma akan.
Thou dost not know, adeka ma takan.
He does not know, husugga ma yekan.
She does not know, aida ma takan.
We do not know, anaka ma nakan.
Ye do not know, adinka ma takanen.
They do not know, aigu ma yekanen.

Future Tense.

I will not go, aneka taghi mayu.
Thou will not go, adeka taghi maisu.
He will not go, husugga taghi mayu.
She will not go, aida taghi maisu.
We will not go, anaka taghi maino.
Ye will not go, adinka taghi maisan.
They will not go, aigu taghi mayan.

Present Tense.

I cannot, aneka ma kurro.
Thou canst not, adeka ma kurtid.
He cannot, husuggu ma kurro.
She cannot, aida ma kurto.
We cannot, anaka ma kurro.
Ye cannot, adinka ma kurtan.
They cannot, aigu ma kurran.

Past Tense.

I was not able, aneka ma kurren.
Thou wast not able, adeka ma kurten.
He was not able, husugga ma kurren.
She was not able, aida ma kurten.
We were not able, anaka ma kurren.
Ye were not able, adinka ma kurten.
They were not able, aigu ma kurren.

Imperative Prohibitive.

Singular.
Do not go, ha tughin.
Do not eat, ha unin.

Plural.
Do not go, ha tughina.
Do not eat, ha unina.

Do not travel, ha dofin.	Do not travel, ha dofina.
Do not speak, ha hudlin.	Do not speak, ha hudlina.

The past participle is frequently formed by adding ŭn to the Verb, as hed to shut, hedŭn shut; kŭr to write, kŭrŭn written; dim to slay, dimŭn slain.

The Verb is always the last word in the sentence.

Our infinitive, as to do, to make, &c., is expressed by the conditional form preceded by inún. Ex.—I wish to go there, aneka inun hulku tŭghu, yan doniah; I wish to buy a goat, aneka reh inun ibsiddŭyan doniah; I am not able to speak the Somauli language, aneka ma kurro inun afki Somaliah ku hudlu.

Ban or yan frequently precedes the verb, and expresses willingness, or intention, as I will go, aneka ban taghaya; or it is my intention to go: I want some water, aneka beha yan doniah.

The interrogative is expressed by ma, as, Is this knife yours? mindida ma zaleh? Will you sell this? adeka waha ma ibunisa?

How much, or how many, by the word inmisa, as, how much money? inmisa lagh? How many people? inmísa dŭd? How old? inmisa jirti?

The Copulative Conjunction and is expressed by ya, as, I and thou, aneka ya adeka: bread and water, kibis ya beha.

The Interjections in most common use are, arug, behold; hamus, hush; wurya, ho, holloa; yaya, alas.

The Verbs joga, jirra, to be, are frequently not expressed, as aneka wa nuksun, I am good: aigu wa bukan, they are unwell.

The article ka, ga, is frequently affixed to Nouns, whether they be definite or indefinite, and also to most Nouns introduced from the Arabic, as, merkubka, the ship; bŭghlka, the mule; sultanka, the king.

To have is expressed in Somauli by the verb aisittah, as, I have, aneka wa aisittah; thou hast, adeka wa aisittah; he has, husugga wa aisittah; I had, aneka wa aisun jirri: he had, husuggu wa aisun jirri; I shall or will have, aneka wa aisun dona; I have not, aneka ma aisitto; he has not, husuggu ma aisitto.

Dialogues and Sentence.

Good morning to you, muberi dēn.

Reply. Good morning, hail le berya; or berina.

How are you to-day? adeka we siddi manta?

Reply. I am quite well, aneka wa sisun.

From where have you come ? adeka huggika temid ?
I have come from the bazar : aneka soghi ban ka emid.
Where is your house ? agulkagi meha ?
What news is there to-day ? maha wur jirrah manta ?
Reply.—Good news, nubud wur jirrah.
What do you want to-day ? adeka manta mahad donisa ? Nothing, wahba.
I want some water : aneka beha yan doniah.
What is your name ? adeka muga-ah ?
Where are you going ? adeka hugoo tughisa ? or hugoo kaisa ?
I am going to my house : aneka agul kaigi ban taghaya.
Speak in the Somauli language : affki Somaliah ku hudl.
I am unable to speak it : aneka ma kurra inun ku hudlu.
Who taught you the Somauli language? aiya ku burray afki Somaliah ?
Do you know my name ? adeka muga aigi ma takan ?
I do not know it : aneka ma akan.
How old are you ? adeka inmisa jirti ?
Will you sell this ? adeka waha ma ibunisa ?
Yes, I will sell it : ha, waha aneka ibunaya.
I will beat you : aneka kugu dufunaya.
Will you buy this ? adeka waha ma ibsunisa ?
I will buy it : waha aneka ibsunaya.
Hold my horse : furuskaigi kuboo. I will hold it, aneka wa kubunaya.
What have you brought ? adeka mahad kenti ?
Bring me a good spear : adeka wurn wa nuksun eken.
I want a mat : aneka durmah yan doniah.
Do you know what he says ? adeka ma takan, husuggu mehu leyahai ?
Is this knife your's ? mindida ma zadeh ?
Yes, this is mine : ha, waha aneka aleh.
Is much coffee produced in your country ? maghaladadu būn budun ma kabaha ?
Is any fresh water procurable here ? mesha beha mahan malaga heleh ?
What is the charge for a camel load ? awurka humlgisi inmisa lusiah ?
Of what tribe are the inhabitants of this place ? dudka maghaladatun wa tulmah ?
How far is the town from the shore ? maghaladu hebta inmisa hujirta ?
I wish to purchase some sheep : aneka ari inun ibsidda yan doniah.
I saw you to-day in the bazaar : manta aneka soghi ku arkai.

What were you doing there ? adeka mesha mahad ka sumainisi ?
I went to buy some food : aneka mesha tughi, inun haroor ibsuddu.
I will come to your house to-day : aneka manta agulkagi emanaya.
I want some bread and salt : aneka kibis ya usbooh yan doniah.
I wish to buy some butter and rice : aneka beris ya subuk inun ibsiddu yan doniah.
Bring me some milk : adeka hanu eken,
Do you drink milk ? adeka hanu ma dumisa ?
Yes, I do drink milk : waiyahai, aneka hanu wa dumaya.
Do you drink coffee ? adeka bŭn ma fodisa ?
Do you smoke tobacco ? adeka buri ma fodisa ?
Have you ever been to India ? adeka wulli Hindi ma tukti ?
What pay do you require ? adeka inmisa mashahrah donisa ?
I will give you ten dollars a month : aneka tobun kurshi mashahrah ku sinaya.
Will you travel with me, there is no danger ? adeka maila dofisa, hubsi ma jirra ?
Do you want this ? adeka waha ma donisa ?
At Berbera salt is very dear : Berbera usboohdu waku ghana aduktahai.
At Mocha rice is very cheap : Mokha beris wa ku ghana jubayahai.
To whom do these sheep belong ? ariga aiya aleh ?
I do not want this : aneka waha doni maya.
Last night a ship arrived from Mocha : hali doni Mokhaki temid.
Two hundred camels arrived to-day : manta lubah bŭghl awra sogushi.
Bring me some good water : adeka beha wa nuksun eken.
Are there any wells here ? meshatun hel ma ku jirra ?
Is there any danger of the natives ? meshatun dudka malaga habsidda ?
There is no danger : hubsi ma jirra, or malaga buga ?
What is the matter with you ? mahad ku helay ?
Are you sick ? adeka ma bukta ?
Do you want some medicine ? adeka dowa ma donisa ?
What are you doing ? adeka mahad sumenisa : come quickly, duksa kali.
I called for you : ana ku yerai. Why did you not come ? adeka mahad emanin ?
He killed him with a spear : husuggu wŭrnba laku dillai.
He struck him in the back with a spear : husuggu duberka wurnbalaku weramai.
Do you know him ? adeka husuggu ma takan ? Yes, I do : ha ana wa akan.

I am afraid to go there : aneka inun huga tugha banka baghaya.
I wish to purchase a goat : aneka reh inun ibsiddu yan doniah.
I will give you eight dollars for this cow : sa-ah durardi sided kurshi banku sinaya.
Give me : ē sih. Shew me, ē tus. Give him, sih husugga.
I am very thirsty : aneka hurrad wa budun bahaya.
It is very hot: wa kūl bundun. It is very cold : wa dahan budan.
Remain here : hulka furiso. Open the door ; albabka fŭr.
I will go to my country : aneka mughaladaidi ban tughaya.
Where is the book ? kitabki meha ? In the box : sunduku ku jirra.
Are you able to do this ? adeka waha ma kurta inud fushid ?
What are you looking at ? adeka mahad arkisa ?
Tell me, what will be the charge : ida, waha inmisa lusiah.
Where did you buy this cloth ? adeka dŭrrka hugeki ibsuddi ?
Where is the Captain of the vessel ? nakhoda donida meha ?
Did you buy this, or barter for it ? adeka waha ma yibsuddi, musowa dorsutti.
The Captain of the vessel is on shore : nakhoda donida hebta jirra.
Take a chair and sit down : kursiga ken, ku furiso.
When will you do this work ? adeka gormad shŭglka sumenisa ?
I will finish it in four days : aneka afarr durarod dubeded wa damānaya.
I am going to Mocha to-morrow : beri aneka Mokha ban taghaya.
Shew me a sample of the rice : beriska ainadisa etus.
Where did you hear this ? adeka waha huge ku mugshi ?
I heard it yesterday in the road : aneka shullai jidki ku muglai.
It is cooler to-day than yesterday : manta shullaiki kabbu.
Are there any fish in this water ? behaha kulon ba ku jirra ?
I want to purchase a good dagger : aneka bilawa wa nuksun inun ibsidda yan doniah.
I am very busy to-day : manta aneka shūgh budun ban leyahai.
Take the horse home, and bring it at 6 o'clock : furuska agulki hūkai, liyah sa-adod kulka ken.
Why did you go to sleep ? adeka mahad hu siati ?
What o'clock is it ? aminka inmisa sāādod.
Does your wife make mats ? nagtadu durmoink ma fulkisa ?
I do not understand what you say : mehad ledahai, aneka kŭrn maya.
Is your knife sharp ? mindidadu wa aff buduntahai ?

This box is very heavy, how can I carry it ? sundukasu wa ulusihai, aneka sidiya hukada ?

Fill this tub with water : bermilka beha ku shūb, or ku bohi.

The river is very deep : durdurka wa dŭdun.

Where is there a well of good water ? helki beha wa nuksun mehe ?

Take some water to quench your thirst : hurradku kabashi, beha hab.

I caught a large fish yesterday : shullai hŭl kulon wen ban kabtai.

Look at this large snake, kill it : mŭska wen arug, dil !

Are there any lions in this jungle ? dirtasu libah ma ledahai.

How many days' journey is Hurrur from Berbera ? Hurruri eiya Berbera inmisa sufrku sugada ?

I came here for the purpose of seeing you : ana hanu emid, inun ku arku.

Bring me some hot water : beha kulool eken.

This is a counterfeit rupee : rupeahtasu wa untahai.

He is now quite blind : husuggu aminka wa hindolaya.

Do not laugh : ha kushn. He is deaf : husuggu wa daghola.

Do not sell this : ha yibsun in ! I cannot hear : aneka ma kurra inun muglu.

Do not go there : mesha ha tughin. Do not eat : ha un in.

One of his camels died to-day : manta awurkisi midba dintai.

Put these things in a basket : amamada kolaiga ku rid.

Tie them with a rope : heeriga ku hed.

This is a very barren country : maghaladasu wa budun hedla.

He died yesterday : husugga shullai demai.

The wind is very strong to-day : manta wa dubel wen.

Give food to the horse : furuska huroorka seh.

Be not afraid : ha bŭgin. I am afraid : aneka wa bughaya.

He is a great rascal : husugga wa tugh wen !

How much money have you ? inmisa lagh ai sittah ?

Do you think that I will learn quickly ? adeka ma garanisa inun duksa barunaya ?

Yes, I think so : waiyahai, aneka wa garanaya.

I wish to go to Lahedge : aneka inun Lahedge tughoo yun doniah.

Do you think they would kill me, were I to go there ? adeka ma garanisa inai e dilli donan, adi aneka tughu ?

This horse cost me two hundred rupees ; furuska luba bughul rupeahd ot ban sistai.

Bring me a bow and arrow : kansi ya fullad eken.

He crossed the river : husugga durdurki katalabi.
He is blind of one eye : husugga wa ilaiyahai.
Your face is very black : wujihgagu wa budun mudoyahai.
Tie up the horse : furuska hed.
I every day forget : aneka wawulba wa ilaba.
I sleep here every night : aneka huben wulba hulka scheda.
It is a very dark night: aubenki wa budun gudoor.
You must always wear clean clothes : kulwulba dŭr wa nuksun huwutta.
Shut the door : albabki heli. Open the door : albabka fur.
If eel very cold : aneka wa budun kububai.
The heat is greater to-day than yesterday : manta shullaika kulul.
I have read that book : aneka kitabka nuksutti.
Read this book : kitabka nŭk.
Bring me some string : herig yer eken.
I have lost my knife: aneka mindi daida alehai.
I will not do this : aneka waha fulli mayu.
I will not go there : aneka mesho tughi mayu.
I will not eat this : aneka waha uni mayu.
I will not drink this : aneka waha dummi mayu.
Are you lame? adeka wa lŭglu ?
The horse kicked him on the leg : furuska ku dumbay berai adinkisi.
You are like a dog : adeka sida ae batai.
There is a stone in the horse's hoof : kobubki furuska dagha ba ku gullay.
Are you married ? adeka ma gursutti ? Yes, I am married : waiyahai, aneka garsuddi.
How many children have you ? adeka inmisa wilŭl ledahai ?
Where is your husband ? ninkagi meha ?
He is unwell : husugga wa buka.
He killed him with a poisoned arrow : husugga fullad wa bayela bala ku dillai.
I will take medicine to-day : aneka manta dowa yan dumaya.
How many men were killed in the fight ? inmisa daghalki ku dintai ?
I will fight you : aneka ku dughalamaya.
His wound is now healed : aminka kontisi buskutti.
Who wounded you ? aiya kugu duftai, or komai ?
You are very fat : adeka wa budun shilistahai.
You are a great eater : adeka wa una buduntahai.

Why do you cry ? adeka mahad oisa ?
Who has beaten you ? aiya ku dillai ?
I saw a corpse lying in the road : aneka nin meyada jidki ku arkai.
He cut off his head with a sword : husugga seif mudahe kaga gohi.
I had a dream last night : aneka hali wada dabai.
I said so only in jest : aneka haiyayer ban sida irid.
The mare is quite tired : geyu wa sodikantai.
I have come a long journey : aneka mel fug ban ka emid.
Are these sheep fat or lean ? arigasu ma shilisihai, musowa wedseyahai ?
Can you lift this stone ? adeka dughaha inud ghadid ma kurta ?
When will you come ? adeka gormad emenisa ?
It will rain to-day : manta rubadi.
I will give you as much as you require : adeka inta donisa, wa ku sinaya.
Can you speak in the Arabic language ? adeka ma kurta inun afki Arabi ku hudul.
I am able to speak a little : aneka wa honga ban kurra inun ku hudlu.
Where are you taking these cows ? lohda hŭge gēnisa ?
His foot is cut off : adinkisu wa gohayahai.
Have you eaten your food ? adeka kadadadi ma untai ?
Were I to beat you, you would die : adi aneka ku dillu, adeka wa dimun.
This rice is full of sand : beriska kunu wa uff budaiyahai.
He was stung by a scorpion : angurunli ba kaninai.
The ship will sail to-morrow morning : beri subahdi murkubki dofiya.
I want to procure some good shells : aneka inun hunes wa nuksun inun hela yun doniah.
There are no slaves in my country : maghaladaidu bidod ma leha.
Spread this mat upon the floor : dolka durmahda gughol.
Yesterday a boat laden with coffee sank : doni bun kubbu buya ba diktai.
Why do you do so ? adeka mahad sida awfulisa.
I dare not tell a lie : aneka ma kurru inun bein sheigu.
There are a great many rats here, meshatunu wa jir buduntahai.
He is now living in the hills : husugga aminka borta hŭrsunaya.
He ran away, being much in debt : husugga hurrur, gan lugu laha.
Catch the thief, and imprison him : taghi, la kabaigu, lahed.
I am going to build a house : aneka agul ban dissun.

Tell the horsekeeper to tie up the horse : furusgiro deh, furuska hed.
Is the horse lame ? furuska ma luglayahai ?
What has lamed it ? maha lugterai ?
He was hung for committing murder : husugga nin bu dillai, hulu alagai.
We travelled all the way on foot : husugga jid wulba adinkusu aiku murrag.
How many men are in your ship ? donahdadu inmisa dŭd kujirra ?
Are there many snakes in your country ? maghaladadu mŭsŭs ma buduntahai ?
He stabbed with a dagger and he died : bilawahe ku weremai, hu dintai.
Why do you laugh ? adeka mahad ku guslisa ?
Can you steer a vessel ? adeka ma kurta inun donida shukunta kubtid ?
Have you ever been at sea ? adeka willi ma dofti ?
Is there a blacksmith in this place ? meshatun tumal ma ledahai ?
I wish to purchase some iron : aneka inun bir ibsudda yan doniah.
Are you able to row a boat ? adeka ma kurta inun seibka wŭdid ?
Bring me a good camel : awur wa nuksun eken.
Bring water for the ship to-morrow morning : beri subahdi merkubka beha hu ken.
Call to-day, I will pay your bill : manta kali, aneka hisabtadi anku seh.
Listen to what I tell you : wa æna ku leyahai, mŭgŭl !
Tell him to light a fire : wa hutidada dŭbka shid.
I must change my clothes : aneka inun dŭrka dorsudda yun doniah.
He plundered the inhabitants of the town : husugga dŭdki maghalada wada deha.
How many ships come to Berberah ? inmisa murkubba Berbera yemanaya.
What merchandise do they bring ? mahai buzahah ka kenaya.
Are there many robbers in your country ? maghaladadu tughug budun ma ledahai ?
To what tribe do they belong ? aigu wa tu!mah ?
That woman is very pretty : nagtasu wa budun nuksun[illegible]hai.
Are you a slave ? adeka ma bidah tahai ?
What will you take for this ? adeka inmisa ku donisa ?
Will it be moonlight to-night ? awa daiyahu ma sobeh ?
What will you take for that dagger ? bilawahas inmisa ku donisa ?

You ask too much for it : adeka wa budun ku donisa.
He is very ill wit h fever : husugga humŭdbu hubuka.
He has a large ulcer on his leg : adinka bog wen ku leyagahai.
What do you apply to ulcers ? adeka bogta mahad ku daitha ?
Do you want some medicine for them ? adeka bōgta dowa ma donisa ?
He is a very strong man : husugga wa nin hōg budun.
Is frankincense or myrrh produced in your country ? mughaladadu hŭbŭg eyu mŭlmŭl ma ledahai ?
What articles do the caravans bring from Hurrur ? sufrki Hurruri mahai ka kenen ?
Is ivory procurable in Berberah ? Berberah fōl ma ledahai ?
Take hold of his hand : ganta kubbu.
I have got a pain in my head : mudahha yahanunaya.
He was killed by a fall from his horse : husugga furuski kedey, wa demai.
He has one son, and two daughters : husugga wil, yalubah ghubrod yulaha.
I will purchase ten bullocks from you : aneka tobun dibbi ka ibsunaya.
What will be the price of each ? dibbi giba mahad senaisa.
Does this country produce much corn ? mughaladasu ber budun ma leyahai ?
Your pay is fifteen dollars per month : mushahrahdadu shun ya tobun kurshi.
I will not give you any more : aneka wăha waka budun ku sen mayu.
I will now depart ; adieu ! aneka aminka wa tughaya ; nubdi ?
Are there any zebras in your country ? maghaladadu furru ma ledahai ?
How is your father to-day ? manta aba hin wa siddia ?
Is the cloth red, yellow, white, or black ? dŭrka ma asiha, musowa maren, musowa ad yahai, musowa mudo yahai ?
Bring some wood and light the fire : koryo eken, dŭbka shid.
Is any good wool procurable here ? meshatun doghur wa nuksun malaga hela ?
When will you wash my clothes ? adeka hudmah dŭrrkaiga mairi ?
He has beate[redacted]me without reason : husuggu subub lahan būi kudilli.
Wake me at 6 o'clock to-morrow morning : beri subahdi kulki liyah saadot ē kiyai.
Are your clothes wet ? dŭrrkagu ma jillai siyahai ?
He met me in the road : husuggu jidki ban nuku kulanai.

Which is the way to the town ? jidki maghalida meha ?
Have you had a good voyage ? adeka sohudkagi kheir ba ku eshi ?
Do you understand what I say ? adeka ma gurunisa wa ana ku leyahai ?
Wash your hands and face : ghana mair wujhiga mair.
Milk the cow : lohda lis.
I caught a fox in a trap : dŭbinki aneka dowao ku kubti.
Is this an unsafe road to travel ? jidkasu ma nubud musowa ābsi ?
Do you speak the truth ? adeka run ma leyahai ?
He seized me by the throat : husuggu huno ē kubti.
I never saw him until to-day : aneka manta horted husuggu ma arkai.
Take care, or he will kill you : iskogo, adanud iskogan hu kudilli.
Bring me a good bow string : adeka bogun wa nuksun eken.
We will sail at sunrise : kulku kurahdu sobadi yan dofina.
Swim on shore with a rope : heriga hebta la dŭbalo.
You are very stupid : adeka akl yer tahai.
Tell the groom to come here : furus jirra le hŭdlo kali hŭlka.
Take away this dead dog : äega dintai seyakad.
Have you had the small pox ? adeka furog ma kugu dai.
Bring me a good shield : gashan wa nuksun ēken.
This river is very shallow : durdurkasu wa beha yer yahai.
Put the horse in the shade : furuska hŭdka geh.
He darted a spear at me, but it missed : husuggu wurnbu iguso riddi, igu madahin.
Give me a share of the meat : helibka ghaib iga sih.
How far distant is the sea from here ? bŭd inmisa hulka kafugtai ?
Can you make a sheath for my dagger ? adeka bilawahaigee gŭl ma sumainisa ?
Sew up this sack : kiska tŭb.
Will you sell me this fat ram ? adeka wŭnka shilis ma ibunisa ?
Is there an arrow in your quiver ? gaboya haga fullad ma ku jirra ?
You are very remiss in your work : adeka houlkaga wa tabsun tahai.
Why do you quarrel with him ? adeka mahad husuggu humainisa ?
Buy some provisions for me : sor banu ibsunni.
I perspire very much : aneka wa budun dididaya.
I killed two pigs to-day : aneka manta lubah dofan bandillai.
Is this boat your own ? sumuda ma daleh ?
These are our cows and oxen : sohda ya dibbida aniga alch.
He possesses great power in this country : mughalada husuggu wahog budayahai.
This is very old cloth : durkasu wa budun gubbosayahin.
Put the pot on the fire : disdiga dubka sar.
Go now, and return at 8 o'clock : aminka tugh, sided sa-adot ē kali.
He is naked, give him some clothes : husuggu wa gaweyahai, dur sih.
Will you sell me your necklace ? adeka awdulligagi ma igu ibunisa ?
He owes me ten dollars : tobunkaigi kursh ban emashi.

Every one in the ship was sick: murkubki dudki wawada bukai.
Have you any poultry for sale? adeka doraya ma ibunisa?
It is a very dark night: hubenki wa gudoor budun.
What is the name of this mountain? borta mŭge hed?
Is your mother dead? hubeta ma dimatai?
There are a great number of monkeys here: mesha wa dayer buduntahai.
His house is made of mats and reeds: agulkisu dōr yadŭrmoin.
He was bitten by a mad dog: ā e walun ba gunenay.
He is a great liar: husuggu wa bein budunai.
Have you learnt the Somauli language? adeka affki Somaleah ma bertai?
Lend me some many: adeka lagh amah esih.
Have you loaded the gun? adeka bunduki ma shenadai?
My knife is lost: mindidaidi wayi.
You have got the itch, go away: adeka haddo ledahai, meshatunka tugh.
Can you untie this knot? adeka guntinta inud furtid ma kurta?
Are you hungry? adeka ma gajonaisa?
I killed a hyena with a spear: aneka didur ban wurn ku dillai.
Bring me a lion's skin: san libah eken.
This basket is very heavy: kolaigas wa ulusihai.
Do you eat honey? adeka malabka ma untah?
He shot a hare in the jungle: husuggu bakheilah dillai.
How many kinds of gum are procurable at berbera?
Berbera hubug inmisa aijnadod bai ledahai?
Four kinds; „ „ gum myrrh, gum arabic.
Afarr aijnadod: wadi, hudad: mulmul, habagadi.
Spread some mats in my tent: kheimahdaidi durmah guglun.
Lay some sand before the door: amodka albabka hortisa hushub.
Do you eat frogs? adeka rah ma untah?
I will give you a present: aneka bakshish ku sinaya.
I have eaten my food: aneka sortaidi unai.
My brother was killed in battle: wilalkaigi dughalki balagu dilli.
Is it dangerous to bathe here: ninki hulka ku maidta, ma absa?
I will bathe in the sea: aneka budda ku maidunaiya.
Bring me a camel load of corn: rurmo bera eken.
Butter is made from cream: subugga lubenta laga samaiya.
There is a very heavy dew: wa durub wen.
I have burnt my foot: aneka adinkaigi gubai.
There is blood on your hand: gantadu dik bai ledahai.
Is this basket empty? kolaigasu ma mureyahai?
He is very ill with dysentery: husuggu wa budun alosha hu bukai.
He caught an elephant in a pit: husuggu god murodiga ku kubtai.
My brother was drowned in this river: wilalkai durdurkasu ku haftai.
Do not drink this water: behaha abin.
I travelled there in disguise: aneka hulka sonaiya, muftaidi dorinaya.
His ears are cut off: digihisi wa gonayau.

How did you catch this deer? adeka simad deroda hu kubtai?
My saddle is very dirty, clean it: korahaigu wa usgug budayahai kubbeha.
If you are lazy I will beat you: ada daluntahai ana ku dilli.
He was murdered in the night: husuggu hubenki bala dillai.
These men are very treacherous: dudkasu wa budun wa-ad fur.
I have been here five months: aneka shun bilod hulka fuddi.
I saved him from drowning: ana hafashuddi ka hayi.
He has a large scar on his face: wujhigisa gon wen bakutal.
My dagger is very rusty: bilawa haigi, mirid budun bu leyahal.
There is no rice in this country: maghaladatun beris ma laha.
The boat is laden with salt: samudasu usbooh shenaduntahai.
My house is very far off: agulkaigi wa budun fug yahai.
What hire do you require? adeka inmisa kirad donisa?
To-morrow morning we will set out if it please God:
Beri subahdi adi Allah yerid aniku wa sonainu.
O man, have you any milk, fowls, or eggs to sell?
Nin yoho, adeka hanu, dorah, huga maisa, eibba?
What price do you reqire for fowls: dorah inmisa senaisa?
What is the name of this place? Meshatun mugi aida?
This is not mine, it is your's: wahas aneka maleh, adeka aleh.
Whose mare is this? geyuda aiya aleh?
Answer. Mine: aneka aleh.
It is not my fault: aneka wa hun ma fullin.
This is a bad person: ninkasu wa ninhun.
Why don't you make haste? adeka mahad so duksa wedi?
Why did you not come yesterday? adeka mahad shullai emun wedi?
I was very busy, I was unwell: houl budun ban lahâ, aneka wa bukai.
What is the matter with you? adeka mahad ku clay?
The people of this country are very bad, they rob and kill, they are without fear:
Dudka mughaladun wa unyahai, wa toghug, wa dillan, aigu ma bugan.
I am not afraid: aneka ma bugha.
There is no difference between them: wahba uma daiyan.
He has changed his mind: husugga iskudda.
He reached his house after three days' journey: husugga sadah durarot bu sodai, wa agulkisu yemid.
This is new year's day: manta wa [redacted]nahda hurtedi; or dubshid.
He left me last year: husugga kul orai yu ega tughai.
I have broken my sword, can I buy another here? aneka seiftaidi jubshai aneka kulka ma kurra inun mid kulatu ibsuddu.
I have lost my dagger, sell me your's: aneka bilawa haigi hulchai, bilawahaga iga ibe.
The Somal fight with spears, and stones: Somalido wurmayo ciya dagha yeku dughalaman.

Each man carries two spears : nin wulba lubah wurn yu kata.
Are there any robbers in the road ? jidki toghug ma jirran ?
Write your name on this in Arabic : muga hagu afki Arabi ku kur.
Where do you travel from this country? mughaladatun hugee dofisa ?
Do you eat dates ? adeka timeta ma untah ?
No, I live upon meat and milk : maya, aneka helibka ya hanu yan unah.
Will you travel by land or by sea ? adeka ma dofisa, musowa beriga sonaisa ?
What do you eat when on board ship ? ida adeka donahda ku jogta, mahadunta ?
I will sleep here to-night : aneka awa hulka yan siyanaya.
Awake me early in the morning : beri wa dowadka ē keyhai.
Bring my mule : bughulkaigi ēken.
Do people ride donkeys in your country ? mughaladada dudku dabera ma folah ?
Does this horse kick ? furuskasu ma dumbabera ?
He is a poor man : husugga ninkasu wa miskin.
He is a rich man : husugga wa ninlagh budun.
His house is near the mosque : agulkisu wa musajida agteda.
Does this road lead to the town ? jidkasa mughalida ma tugha ?
Do you bathe in the sea ? adeka budda ma ku maidutta ?
Are you able to swim ? adeka ma dubalin kurta ?
Yes, but I am afraid of sharks here : waha, hulkakun libah anka bugga.
I want a pair of shoes and a turban : aneka amamud ya kubbu yam doniah.
He is gone to the market : husugga soghi tugh.
What you say is true : hudulkagu waruntah.
Can you write a letter in Arabic ? adeka ma kurta inud wurkud afki Arabi ku kurtid ?
Why did you not bring the camels to-day ? adeka manta mahad awurti hu ken wedi ?
Excuse me, I forgot it : wa alabai, kai iskudda.
Go and purchase me some firewood : tugh kurrio so ebi.
I want twenty donkeys to carry water : aneka yan doniah lubatun dubera behagada.
Drink this milk, and eat this bread : hanuha dun, kibista un.
I am not hungry, and never eat bread : aneka gaju ema aisu, kibista uni mayu.
Do not forget to come to-morrow evening : beri mughribki wad emanaisa, ha alabin.
I wish to hire a good boat : aneka doni wa nuksun kirra yun doniah.
Two men were murdered last night : hali mughribki lubah nin bala dillai.
The Gallas murdered them : Gallahdi ba dillai.
The Somal fear the Gallas very much ; Somaulidu wa budun bai Gallahda kabugda.

They put to death any they can seize : ninka kubtamba wa dillan.
They all dwell in the mountains : aigu hedilkod borta furestan.
Go to the well and bring some water : helki tugho, behaka ken.
This is brackish, and not fit to drink : beha hasu wa denayin, inla-aba had maha.
How many eggs do you sell for a dollar ? inmisa ugaod kurshigi sinaisa ?
Bring me some butter and cheese : adeka subuk ya jibban eken.
This is too dear : waha budun bu ghana adugyahai.
I will not buy it, take it away : aneka ibsun maya, lutugh.
Load the camels and proceed quickly : awurka rur, ho soh.
Has the caravan arrived from Hurrur : sufrki Hurruri ma yemid ?
Do they bring ivory and coffee ? aigu fol ya bun ma kenan ?
How many camels come to Berbera every year ? sunud wulba inmisa awur Berbera sogusha ?
Go and buy me some price : sikka, beris no ebi.
I had no sleep last night, from the annoyance of the musquitoes : Keniyada hununkedi yan hali la sehaway.
This is a very old ship : donidasu wa budun bai dogtai.
Fill the sacks with corn : kisuska huroorka ka buhe.
He was drowned in crossing the river : husugga durdurka kulku ka talabai huyudintai.
Are there any crocodiles in this river ? durdurkasu jahas ma kujra ?
Do they ever bite people ? jahasku dudka ma una ?
The dogs and jackalls are very troublesome : acda ya dowada wa budun ban adoza.
How do you kill lions ? adeka sidebad libahaida ulcsa ?
Do you fight with bows and arrows ? adinku gansuddaya fullada maku dirratan ?
Is this poisonous ? wahasu wahbaiyu ma leyahai ?
If you behave well, I will encrease your pay : ida siwa nuksun yeshid aneka mushaprahda ku budin.
This horse is very thin, have you fed it ? furuskasu wabudun wed seyahai, adeka wa ma siyisi ?
He struck me on the face : husugga wajhga yaku duftai.
Has he given you your pay ? husugga mashahradadis ma ku siyi ?
Do you wish to go to your country ? adeka inud mughaladadi tukti ma donisa ?
Is your father alive ? abah ma nolihai ?
How many months have you been here ? adeka inmisa bilod meshatun fududai ?
Have you ever been wounded ? adeka dainka ma bogodai ?
Yes, I was wounded in the head with a spear : ha, mudaha wurn lai ku duftay.
Are there many rats in your house ? agulkagu ma jir budayahai ?
He denies having said this : husugga ankir ma ora nin.
I have dropped my knife into the water : mindidaidi beha ku dadai.

There is no oil in the lamp : sirajku selit ma laha.
He is both deaf and dumb : husugga daghal aiyahai, ya lablaiyahai.
I know not whether this be true : aneka ma akan hudu rugahai.
He swam across the river: husugga dubalai, wa durdurki katalab.
He was burnt to death : husugga gubai.
When did you marry ? adeka hudmah gursutti ?
I will come this evening alone : manta aneka kelidai emanaya.
When did you leave Berberah ? adeka hudmah Berberaka sobadai ?
Four months ago : afarr bilod hurtod.
Have you sold the saddle ? adeka kori yibsi ?
His boat sank in the gale : donidisi dubel wēn digisi.
Is your camel frightened ? awurkagi bug ?
He speaks Arabic very well : husugga afki Arabi nuksun hudla.
I am going to prayers to-day : aneka manta sulatka tughaya.
Are there any rivers in your country ? mughaladadu durduro ma ledahai ?
Why do you not wash your clothes ? adeka mahad durkagu umaidi wedi ?
My wages are less than his : mashahrahdaidi mashahrahdisu ka yēr.
I went there, but saw no one : aneka hulko tughi, idna ma arug.
What is on your camel ? mahad awurkaga sarun ?
Slaughter a sheep for me : nēf ē gora.
I will kiss you : aneka ku dunkunaya.
He kissed the ground before me : husugga hurtai dulki dunkay.
Take ten days' provisions with you : jasin tobun ayamod kad.
I will remain there eight days : aneka sided ayamod hulkas fudeyu.
How do you get your living ? adeka hugika shugaka sittah ?
Do you know who struck you ? adeka ma takan ninki kugu duftai ?
Have you ever been to his house ? adeka willi agulkisi ma tukti ?

The following Literal Translation of part of the Dialogues will shew the idiom of the language.

Adeka wa sidi manta ?	Aneka wa sisun.
You how are to-day ?	I am well.
Adeka hugika temid ?	Aneka soghi ban ku emid.
You from where have come ?	I from the bazar have come.
Agul kagi mehyu ?	Maha wurjirrah manta ?
House your where is ?	What news is to-day ?
Nubud wur jirrah.	Adeka maha donisa ?
Good news there is.	You what do want ?
Aneka beha yan doniah.	Adeka muga ah ?
I water do want.	Your name what is ?
Adeka hugoo tughisa ?	Aneka agul kaigi ban tughaya.
You where are going ?	I house my am going.
Afki Somaliah ku hudl.	Aneka ma kurra inun ku hudlu.
The language Somauli speak thou.	I not able that I should speak.
Aiya ku burray afki Somaliah ?	Adeka muga aigi matakan ?
Who you taught the language Somauli.	You name my do know ?

Aneka ma akan.
I not do know.
Adeka waha ma ibunisa ?
You this will sell ?
Aneka kugu dufunaya.
I to you will beat.
Waha aneka ibsunaya.
This I will buy.
Adeka wurn wa nuksun eken.
You a spear good to me bring.
Mindi da ma zaleh ?
Knife this is your's ?
Mesha beha mahan malaga heleh ?
Here water fresh is not procurable ?
Awurka humlgisi inmisa lusiah ?
A camel load its how much price ?
Dulka mughaladatun wa tul mah ?
The people city of this what tribe are ?
Mughaladu hebta inmisa hu jirta ?
The town from the shore how far is ?
Aneka ari inun ibsidda yun doniah ?
I sheep that I should purchase do wish.
Manta aneka soghi ku arkai.
To-day I in the market you saw.
Adeka hanu ma dumisa ?
You milk do drink ?
Adeka inmisa jirti ?
You how old ?
Waha aneka ibsunaya.
This I will sell.
Adeka waha ma ibsunisa ?
You this will buy ?
Furuskaigi kuboo.
Horse my hold.
Aneka durmah yan doniah.
I a mat do want.
Waiyahai waha aneka aleh.
Yes this mine is.
Adeka bun ma foda ?
You coffee do drink ?
Aneka tobun kurshi mashahrah ku sinaya.
I ten dollars monthly pay you will give.
Adeka waha ma donisa ?
You this do want ?
Adeka ma bukta ?
You are sick ?
Duksa kaleh.
Quickly come.
Aneka maghala daidi ban taghaya.
I country to my will go.
Adeka durka hugeka yibsitti ?
You the cloth from where did buy ?
Aneka waha doni maya.
I this want do not.
Adeka mahad sumenisa ?
You what are doing ?
Aneka ku yerai.
I you called.
Wa dahan budun.
It is cold very.
Nakhoda donida meha ?
The Captain of the ship where is ?
Adeka waha mai yibsutti, musowa dorsutti ?
You this did buy, or did barter ?
Adeka gormad shuglka sumenisa ?
You when this work will do ?
Behaha kulon ba bu jirra ?
In this water fish any are there ?
Adeka waha huge ku mugshi ?
You this where did hear ?
Aneka bilawa wa nuksun inun yibsudda yan doniah.
I a dagger good that I might buy do wish.
Manta aneka shugl budun ban leyahai.

To-day I work much have.
Furuska agulki hukai, liyah sa-adot hulka ken.
The horse to the house take, six o'clock here bring.
Wahad ledahai, aneka kurn'mayu.
What you say, I understand do not.
Sundookasu wa ulusiyahai, aneka sidiya hu kaza?
Box this is heavy, I how it can carry?

Durdurka wa dudun.
The river is deep.
Helki beha wa nuksun meho?
A well water of good where is?
Manta awurtisi midba dintai.
To-day from his camels one died.
Aneka hanu emid, inun ku arku.
I here came, in order that you I should see.
Shullai hul kulon wen ban kubtai.
Yesterday one fish large I caught.
Furuska huroorka seh.
To the horse food give thou.
Adeka ma garanisa inun dubsa burunaya?
You do not think, that quickly I will learn?
Adeka ma garanisa inai e dilli donan, adi aneka hulku tughu?
You do not think that to me they would kill, if I there should go?
Kansu ya fullad e ken.
A bow and arow to me bring thou.
Herig yer e ken.
String a little bring me.
Adeka wa luglu?
You are lame?
Kobubki furuska dagha ba ku gullay.
The hoof of the horse a stone has entered.
Husugga fullad wa bayela bala ku dillai.
He with an arrow poisoned him he killed.
Aneka manta dowa yan dumaya.
I to-day medicine will drink.
Adeka inmisa wilul ledahai?
You how many children have?
Ninkagu meha?
Your husband where is?
Adeka wa budun shilistahai.
You very fat are.
Aneka mel fug ban ka emid.
I a journey distant have come.
Husugga seif mudahe kaga gohi
He with a sword his head cut off.
Adeka inta (or inmisa) donisa, aneka wa ku sinaya.

Muskasu sun ma leyahai? [possess?
This snake poison has it? or does it
Husugga aminka wa hindolaya.
He now is blind.
Heriga ku hed.
With a rope tie thou.
Muska wen arug, dil!
The snake large behold, kill it!
Husugga wa tugh wen.
He is a thief great.
Hubenki wa budun gudoor.
The night is very dark.
Aneka mindi daida alehi.
I knife my have lost.
Aneka mesho tughi mayu.
I there will go not.
Aiya ku dillai?
Who you has beaten?
Aiya kugu duftai?
Who you has beaten?
Geyu wa sodikantai.
The mare is tired.
Adeka gormad emenisa?
You when will come?

You as much as want, I to you will give.
Adeka me kurta inun afki Arabi ku hudlu ?
You are able that the language Arabic could speak ?
Lohda huge genisa ? Adinkisu wa gohaiyahai :
The cows where are you taking? His foot is cut off.
Husuzga aminka borta hursunaya :
He now in the hills is residing.
Meshatunu wa jir buduntahai. Maghaladaidu bidod maleha :
In this place rats are many. In my country slaves there are not.
Adeka mahad ku guslisa ? Adeka willi ma dofti ?
You why do laugh ? You ever have been a sea voyage ?
Awur wa nuksun eken : Aneka inun bir ibsuddayan doniah :
A camel good to me bring. I that iron I should buy do wish.

The Somaulies express the days of the week in a similar manner to that of the Arabs, as, day the first, second, &c., as follows :—

Monday, malinta oray.
Tesday, malinta lubad.
Wednesday, malinta sudad.
Thursday, malinta afarrad.
Friday, malinta shunad.
Saturday, malinta liyad.
Sunday, malinta tudobad.

The names of the months are as follows :—

1st, Sabooh, corresponding with August.
2nd, Waberis, „ „ September.
3rd, Songad, „ „ October.
4th, Sonfur, „ „ November.
5th, Sidahtal, „ „ December.
6th, Dago, „ „ January.
7th, Hurafo, „ „ February.
8th, Biluroreh, „ „ March.
9th, Bil Duradumbeh, „ April.
10th, Rujl Horeh, „ „ May.
11th, Rujl Deha, „ „ June.
12th, Rujl Dumbeh, „ „ July.

The months are lunar: the year is computed in the same manner as the Arab year, so that new year's day (termed by the Somaulies dŭbshid, a word compounded of dŭb and shid, signifying to light a fire, from a festival peculiar to that day) also falls on the same day as the nāiros or ras al sanah of the Arabs.

The following Stories will serve as Examples of Somauli construction.

A person making it a practice to buy six loaves every day, a friend asked him what he did with six loaves every day? He answered, "I keep one loaf, another I throw away, two loaves return, and two others I lend." The friend said, "I don't comprehend your meaning, speak plainly." He replied, "the loaf which I keep I eat, and the one which I throw away, is what I give to my wife's mother ; the two which I

return, I give to my father and mother; and I lend two loaves to my sons."

Nin liyah kibsod wawulba yibsunjeri, Sahibkisi wediyi, wahu yerid wawulba liyah kibsod mahad ku fusha? Husugga yerid, midba ban dista, mid waridda, lubah kibsod wa heliya, lubah kibsod hudda wa amabasha: Sahibkisi wa yerid, aneka hudlkagu kurrun mayu, e shug; ninki wahu yerid, kibista dego wa una, kibista an toro sudodai ban siyah; lubad an iliyu abai ya hoyadi ban siyah, lubah kibsod hudda wila-shaida amasha.

One day a tyrannic king, having gone out of the city unattended, saw a person sitting under a tree, of whom he enquired, "What is the character of the king of this country? is he oppressive, or just?" He answered, "A great Tyrant.' The king said, "Do you know me?" He answered "No." The king rejoined, "I am the Monarch of this place." The man was terrified and asked "Do you know who I am"? The king said he did not. He rejoined, "I am the son of such a merchant: three days in every month I lose my senses, and this is one of those three days." The king laughed, and ended the conversation.

Durar Sultan mughaladisu wa kubay, kelidi, nin ged hosti fudiya yu arkai, wahu yerid Sultanki mughaladatun ma zalimba musowa nin geryakan? wa hu yerid wa zalim wen; Sultanki wahu yerid adeka so ma tughanid? ninki yerid ku ma yekan. Sultanki yerid, aneka mughalida wa Sultanki banai: ninki absodi, kulsasu yerid adeka maegerenisa? Sultanki yerid aneka ku ma akan: ninki ba yerid, aneka in hebit tajir banai, bil wulba sadah durarot yan washa, manta wa durari an walunjeri. Sultanki wa kuslai, huka tughai.

One night a Qazee found in a book that whoever has a small head and a long beard is a blockhead. The Qazee, having a small head and a long beard, said to himself, "I cannot encrease the size of the head, but I will shorten the beard." He sought for scissors but could not find them. Having no other course, he took half his beard in his hand, and carried the other half towards the lamp: when the hair took fire, the flames reached his hand: upon which, letting go his hold, the beard was entirely consumed, and the Qazee overwhelmed with shame, as it verified what was said in the book.

Hubenba kadigi kitabki wa nukai, wa ku arkai ninki mudha yer wa gud wen wa walaiyahai. Mudha kadigi wa yera, gudkisu wa wenah, kulkasu yerid, aneka ma kurra inun mudha aigi wenaiyu, wa kurra inun gudkaiga gabshu, kulkasu muguski donoway, donyo wa, gudkisu bud gantisu ku kubtai, budke kalaitu sirajki waku kubtai, kulki gudkisi kubtai, ea ganti hunontai, kulkasu siday, gudkisi wada kubai, kadigi wa budun bu heshodi, rumesi kitabka wahe kujra.

A person who was going along hungry, saw an Arab eating food by the side of a pond, whom he approached, and said, "I come from your house." The Arab asked, "My wife, child, and camel, are they all well"? He answered "yes." The Arab being satisfied, did not look again at him. The man then began saying, "O Arab! this dog, which

is now lying down in your presence, is such a one as yours, had he been still alive." The Arab raised up his head, and said, " What was the cause of my dog's death" ? He answered, " He eat a great deal of your camel's flesh." He asked, " How came the camel to die" ? He answered, " Your wife died ; after which, no one gave him either grass, corn, or water." He asked, " How came my wife to die ?" He replied, " She wept very much in her grief for your son, and smote her head and breast with a stone." He asked, " How did my son die ?" He answered, " The house fell in upon him." When the Arab heard this detail of the ruin of his family, he flung dust on his head, and went away ; and by this contrivance the man got a dinner.

Nin gajahaisai jidki sonaiya, nin Arab yu arkai, berkud gestida yusor ku unaiya ; huhu tughai, wahu yerid " aneka agulkagi ban ku emid." Arabki wa wediyi, " Nagtaidi, wilkaigi, awurkaigi, ma nubud guben ?" Wahu yerid, " wa nubud guben." Arabki wa afarhai, kulku wurki muglai, berberkisi ma arkai. Kulkasu ninki yerid, " Arab yoho ! aiga hulka hurda aigagu wa mussa hadu nolaiyahai." Arabki mudahisi surokad, wahu yerid, " mahad aigagi dillai ?" Wahu yerid, " hussugga awurkagi helibkisi wa budunka unai." Arabki wediye, " Awurkaigi mahad dillai ?" Wahu yerid, " Nagtadi dimatai ; dubided awurki, gedu, huroor, beha, idna ma sinin." Husugga wediye, " Nagtaidi sida hu dimatai" ? Wahu yerid, " inunkagi durardi, wa budun oe-dai, mudahaidi ya labtaidi, dugha ku dufatai," Arabki wediye, " inunkaigi sida hu dintai"? Wahu yerid, " Agulkagi ba ku sodai." Kulku wurki dudkisi leden muglai, mudahe amud is kaku shobai, jidkisi murrai ; khyanadas yu ninka sortisi ku unai.

Vocabulary.

A.

To abandon : da.
The abdomen: gumar.
To abide : fudeh.
An abode : agul.
Above : dusha.
Absence : mugun.
Absent : mughayahai.
Afterwards : dubeded.
Age : jirti.
Air : dubel.
To accompany : sera.
To accumulate : hurur.
An act, action ; ful.
Adieu : nubdi. Reply ; tissun.
Advantage : munafa-ad. (Arb.)
Alone : midkilya.
Always : kulwulba.
Afraid : bugaya.
Afternoon : zuhr (Arb.)
Agreement : kulun.
Aid, assistance : hil.
Alas ! aiya, bay, bay.
An almond : loz (Arb.)
Altogether : idilkod.
An answer : jowab (Arb.)
An ant : kuran ; plur. kurayu.
Approach : dowan.
An arm (from the waist up) : gan.
Armed : hub, hubayahai.
The arms : ganu, dudumu.
An army : hol ; asker (Arb.)
Ashore : hebta.
Asking : wedin.
Asleep : huruda.
To ask : wedi.
An ass : duber.
Astonishment : yab.
An attack : bob, dughal.

Authority : ghur.
Awake ! kaka !
Away, begone : tugh, tugh.
Aunt (paternal) : ader.
Aunt (maternal) : abti.

The back : duber.
Bad (adj.) : hun.
A bag : kis (Arb.)
Baggage : hamamu.
A balance : mizan (Arb.)
A ball or bullet : rasas (Arb.)
A banner, flag : sumud.
Barren : hedla.
Barren woman : ghol.
Barter, exchange : dafsi, dorsi.
Base : hun, human.
A basket : kolai.
Bathing : maidusho.
A battle : daghal.
To beat : dil, dufun.
Beautiful : ghurru.
Because : durardi.
A bed : goghul.
Before : horta.
Behind : dubada.
Behold : arug.
Belief : itimad (Arb.)
Belly : alol.
Below : osta.
Beside (near) : dowan.
A bet : shurt (Arb.)
Beyond : dubided.
To bid, order : gur.

A camel : awur.
A she camel : hul.
Calling : yed.
I can, am able : aneka kurra.
A cannon : mudfa (Arb.)
A captive : ninki kubai.
Careless : moge.
Carelessness : mogun.
Careful : ruga. Be careful : iskohgu.
Carnage : dinta, lezai.
A carpet : goghul.
As (like) : sidda, sida.
As the moon : sidda tayah.
Avaricious : dumma.
Ate (pret. of eat) : un.
I eat : aneka unai.

B.

Black : mudoya.
A blacksmith : tumal.
Blind : hindola.
Blood : dik.
Blunt, not sharp : yur, tawir.
A boat : donah, doni.
The body : jid.
A bone : luf.
A book : kitab (Arb.)
The bosom : lab.
A bow : gansu.
A box : sunduk (Arb.)
A boy : wil.
Bread : kibis.
To break : jubun.
A bribe : bakshish (Arb.)
A bride : arusah (Arb.)
A bridle : kakamah.
Bringing : ken.
A brother : wilal.
A bull : dibi.
Business, work : houl, shugh (Arb.)
Butter : subug.
Buying : yibsi.
A bug : kutan (Arb.)
To burn : gub.
Burnt : gubun, gubai.

C.

Carrying : sida.
To carry : kad. Carry this : wahas kad.
A cat : dumud.
Casting, throwing : turis, riddu.
Cattle : muwashai.
Certainly : warun, waiyahai.
A chain : silsilah (Arb.)
A change : dursi, dufsi.
Charcoal : dahul.
A charm, amulet : dabah.

A chicken : dorah.
A child, masc. wil.—Fem. ghube.
The chin : gufoor.
To circumcise : gud.
Circumcised : gudun.
A city : mughalu.
Clay : dobo.
Clean : nazeef (Arb.)
A cliff, hill : bor :—plur. boro.
Closed, shut : hedun.
Cloth, of any kind : durr.
A club, or stick : ul, ul wen.
A cock : dorah dijaj (Arb.)
Coffee : bun (Arb.)
Cold : dahan, kabu.
Colour : midubma.
Coming : sosada, emunaya.
To come : emi.
A complaint : gur.
To complain : gurun.
To comprehend : akan, akon.
Continually : kulwulba.
Conversation : hudul.
A cook : kuriya.

A dagger : bilawa.
Daily : wawulba.
Damp : durrub.
Danger : bug, absi.
Dark : gudoor.
A daughter : ghubr.
Day : durar, malin.
A day : malin.
Dead : dimai.
Deaf : daghola.
Dear (high priced) : ghuna dag.
A dart : fullad.
Death : geri.
Debt : gan.
A decree, order : gur.
A deer : dero.
A defeat : bugai.
Delay : ragsin.
Denial : ankir (كال Arb.)
A deponent : murg.
A deposit : amanah (Arb.)
Copper : nahas (Arb.)
A crocodile : jahas.
Crying : ilmo, ohi.
To cry : oh, ilma.
To cut : gohi.
Cut (past) : gohayahai.
Corn : ber.
A corpse : miyet (Arb. ميت)
A cough : kufa.
Countenance : wujh (Arb. وجه)
A country : mughalu.
Courage : gesi.
A cow : sa-ah—plur. loh.
Cord : herig.
Cost, price : lusiah.
Cotton : kutu (Arb.)
A couple : lubah.
Cream : luben.
A crime : human.
Cruelty : dubiad lawi.
Consent : ugullan. (Arb.)
Cheese (of camel's milk) : jibban
A cloud : durror.

D.

Descent : dughitin.
A desert : hedla.
Deserving : wajib (Arb.)
Desire : donis.
Desolate, waste : hedla.
The devil : sheitan (Arb.)
Dew : durrub.
Difficult : kuttu.
Dirt, dirtiness : usgug, wusk (Arb.)
Discharge, release : siden.
Disease : bukan.
Diseased : buka.
Disguise : doris.
Disguised : dori.
A ditch : aug.
To do : ful.
Doing : fulayi.
A dog : a-e.
Doubt : shuk (Arb.)
Drawing, dragging : jidun.
A dream : dudub.

Dress, apparel : durr.
Dried : ingegun. } 1st g as in gander.
Dry : ingeg. }
Drink : dunen, abai.
Drinking ; dun, fozai, abaiya.
To drown : degin, hafin.
Drowned : deg, hafai.
A drug : dowa (Arb.)
A drum : durban.
Drunk, drunken : walun, walai.
Dumb : labla.
Dust : hubas.
A dwarf : ghabnin.
A dwelling : agul.
Dying : demanaya.
A dysentery : alolba.

E.

Each : mid, mid.
The ear : dig.
Early (morning) : beri subah (Arb.)
The earth : dul.
The east : gubul sobeh.
Eating : unu. I will eat : aneka unaya.
Effects, goods : hol, amama.
An egg ; uga, ugaod.
The eight : sidedah.
Either, or : musowa.
Either I or thou : aneka musowa adeka.
The ellow : husul.
The elder, eldest : wen.
An elephant : murodi.
Else, other (pronoun) : midkulla.
Embracing : ligdun.
Employment : houl, shugl (Arb.)
Empty : murun.
End, conclusion : duma.
Ended, finished : dum.
An enemy : adu (Arb.) hul.
An engagement, conflict : dughal.
Enmity : dirur.
Entering, entrance : gellin.
Equal, corresponding : isleg.
Error, fault : human.
Escape : kubbin.
To escape : kubbin.
Evening : mughrib (Arb.)
Every : idil, duman, kul (Arb. كل و)
Every year : sunah wulba.
Every day : wa wulba.
Every night : huben wulba.
Every thing : waha wulba.
Evidence : merig.
Evil (adj.) : hun.
Evil (subs.) : human.
Exchange, barter : isdafsi, dorsi.
Expectation : ilalis.
The eye : il,—plur. indo.
The eyebrows : suno.
An ewe : lah—plur. laho.
Expense : behetin.

F.

A fable : sheku.
The face : wugh (Arb.)
Facing meeting : kulun.
Faint, feeble : wed.
Fair, handsome : wa nuk, ghuru.
Faith (in religion) : din (Arb.)
Falling : deha.
A fall : deh.
False (not true) : bein.
This is false : wa beintah.
Fame : namusi (Arb.).
A family : rer.
A fan : murwaha (Arb.)
Far, distant : fūg.
Farewell : nubdi. Answer—tissun.
Fat (adj.) : shilis.
Fat (subs.) baror.
Fate : nuseeb (Arb.) ayan.
A father : abu (Arb. اب)
A fault : human.
A fawn : dero yee.
Fear : absi, bug.
To fear, be afraid : bugai.
I am afraid : aneka bughaya.
A feast : soriyo.
A feather : bal.

Feathers of ostriches : bal goriyo.
Feeding, eating : unai.
Feet (plural of foot) : adimo.
A feint : khyaneh (Arb.)
A fever : dahan, dahantai.
Female (opposed to male) : didig.
A ferry : talaba.
To fetch (go and bring) : ken.
Few, yer. Few people : dud yer.
Fifteen : shun ya tobun.
Fifteenth : shun ya tobnadka.
A fight : dughal.
Fifth : shunta.
Fiftieth : kuntunadka.
A finger : fur—plural, furrod.
Fire : dub.
To set on fire : gub.
First : kouza—the first : oray.
A fish : kul—plural : kulomo.
To fish, catch fish : jilab.
A fisherman : seyyad (Arb.)
The fist : tuntomo. furrod.
Five : shun. The five fingers : shun
A flag : alan.
Flame : belbel.
Fled (plural of flee) : hurrur.
I fled : aneka hurruri.
Flesh : helib.
Flesh, grilled or roasted : helib mug mudda.
Flowing, as water : dad.
A fly : duksi.

Gain : faido.
Game, sport : aiyar.
A gaol : hubsi (Arb.)
A garment : durr.
A gate : ilin, albab(Arb. ا لبا ب
To gather, accumulate : shir.
A gash, wound : kon.
Gave, (preterite of give) : sehi.
Gay, merry : farhan (Arb.)
To geld : dufan.
Gelt : dufanaya.
Gentle, soft : jille.
To get, acquire : hel.
A foal : furus yer.
Fodder : gedu.
A foe : aduw (Arb.)
Food : sorti—of animals : huroor.
A fool : walun.
A foot : adin.
A footstep : talabu.
For, on account of : darad.
For what ? wherefore : mahad ?
For God's sake : Illahi durardisi.
Force, strength : hog, lahad.
The forehead : wujh (Arb.)
A forest : kein, mi.
Flint : duhun.
Flour : bur.
A form, figure : surah (Arb.)
Former : horta.
Forth, outside : beha, dibudda.
Forty : afurtun.
Foul, dirty : usgug, wasakh (Arb.)
Four : afurr.
Fourteen : afurr ya tobun.
A fox : dowa-o.
Fraud : khyaneh (Arb.)
Free : hurr (Arb. حر)
A friend : sahib (Arb.)
A frog : rah.
From, from where : hugee, ki.
From another : mid kulle.
From the beginning : hurti.
Full : buh.
A funeral : has.

G.

A gift, present : bukshish (Arb.)
A girl : ghubr.
To give : si.
I will give thee : aneka ku sinaya.
Glad : furhan (Arb.)
Glory : namus (Arb.)
Glue : hubug.
A gnat, musquito : kune-aw.
To go : tugh.
A goat : rih—plural : riho.
A he goat : urgi.
A goblet : haroob.
Gold : dahab (Arb.)

Gone (preterite of went) : tugh,—if a sea voyage : dofai.
Good (adj.) : nuksun.
Good news : wur nubud.
Goods : amamu.
Government : gur kur.
The government of the English : gur Ingriz.
Got, gotten : helin.
A gourd : dullo, hubbo.
Grain, corn : ber, huroor.
A grandfather : awuwa.
A grape : inab (Arb.)
Grass : gedu.
Gratis : bilash (Arb. بلا شي)
A grave : hubal—plural : hubalu.
Gravel : amod—buro.
Great : wen.
A great man : nin wen, nin sheikah.
Greater, greatest : ka wen, ka wada wen.
Green (in colour) : akhzar (Arb.)
Grief : hum (Arb. هم)
A grievance : zulm (Arb.)
A groom, horsekeeper : furusjiri.
Ground : dul, amud.
A guest : soroyo.
Guess : o kyas (Arb.)
Guilt : human.
Gum (vegetable substance) : hubug.
Gum Arabic : sumugh (Arb.)
A gun : bundook (Arb.)
Gunpowder : baroot (Arb.)
Guts, intestines : minder.

H.

Habit : a-adut (Arb.)
Habitation : agul.
Hail : dug aiyalah.
Hair, human : timu. Of any animal : daghor.
Half : bud. Half a dollar : kurshi budki.
A halter, rope : herig, herko.
A hammer : dubbah.
The hand : gan.
A hand full : hunkaru, huntobu.
Handsome : ghuru, wa nuksun.
Hand writing : kureen.
Is this your hand writing ? waha adeka kurree ?
To hang : dildil alaga.
Hanging : dildilaiyahai, alagahaiya.
Happy : furhan (Arb.)
A harbour (for shipping) : mughalu.
A hare : bakheilah.
Harm : dinen.
To hear : mugul.
Haste : duksu, digdig.
Hate, hatred : olad.
I have : aneka wa ista. Thou hast : adeka wa ai sitta.
He has : husugga wa sittah. We have : iniku wa aisinna.
Ye have : adinkuwa, aisittun. They have : eigu wa aisittun.
A harlot : dillo—plural : dilloin.
A hatchet : jidib.
Have a care : iskogo.
Hay : aos.
He : husugga, husuggu.
The head : mudha.
A headache : mudha nun.
Health : afimad.
Heard (pret. of hear) : muglai.
The heart : wudna.
Heat : kul.
Heated : kulai, kulul.
Heaven : jinnah (Arb.)
Heavy : holes.
The heel : bugun.
An heir : dhal.
Held (pret. of hold) : kubai, lugabai,
Helm (of a ship) : shukan (Arb.)
Help, assistance : muaonah (Arb.)
A hen (domestic) : dijajah (Arb.)
Hence, from this place : hugee, maishatun.
Hence, for this reason : waha durarod.
Here : hulka, meshatun.
Hereafter : aminka dubeded.

Hid, hidden : kursodi.
To conceal, hide : kurs.
A hide, skin : san, hurg.
High, tall : der.
A highway : jidki.
A hill : bor—plural : boro.
A hog : dofar.
Hold (interj.) : iskudda.
A hole : gud,—plur. gudud.
A rat's hole : gudka jirka.
A scorpion's hole : gudka angurunla.
Holloa : wurya.
Home, at home : agulki.
Honey : malab.
A honey comb : awlul.
His : husugga aleh.
His wife : nagtisi.
Honour : hurmah (Arb.)
Hoof : kobub.
Hoof, of a camel : huggo. Of a sheep : rafuf.
A fish hook : jilbu.
A horn, for drinking out of : ges.
A hornet or bee : shinni.
A horse : furus. Mare, geyu.
Hot : kul. It is hot : wa kul.
Hot water : beha kulul.
A house : agul.
How : wasidda.
How many : inmisa.
How many people : inmisa dudda.
How do you do : adeka wasiddi.
Humble : miskin (Arb.)
A hundred : bughul.
A hundred thousand : bughul kun.
Hung : dildilli.
Hunger : gajo.
Hungry : gajonaya. I am hungry : aneka wa gajonaya.
A hunt : dubut.
A husband : nin gorsuddi.
Hush (interj.) : hamus.
A hyena : didur.

I. J.

I (per. pron) : aneka, ana.
A jail : hubsi (Arb.)
A javelin, spear : wurn.—plur. [wurmo.
A jaw : dun,—plural : damun.
Ice : ghulod. [tabsi.
Idle : tabsi. Very idle, : wa budun
A jest, joke : aiyar.
If : adi.
Ignorance : arur.
Ill (bad) : hun human.
Ill, indisposed : bukan.
Illness, disease : buka.
An image : surah (Arb.)
Immense : wen budun.
In : wa jirra.
In that place : maishu wa jirra.
In the day time : durar, malin.
In the morning : subahdi.
In hand : gantu kujra.
Indeed, in reality : waiyahai, waluba.
Indolence : dal, kurdi.
Indolent : dalaya, kurdobi.
An infant : will murjoa.
Infirm, weak : wed.
To inflame (set on fire) : gub.
Inhabitant : fuddi, dud.
Injury : dinen.
Ink : khud.
Inside : gudaha.
Intoxicated : walaya, dalayahai.
A journey : sodal.
A night journey : sod huben.
Joy : furhah (Arb.)
Iron : bir.
Made of iron : birtaide.
An island : jaserah (Arb.)
The itch : haddo.
A judge : hakim (Arb.)
Juice : dehan.
To jump : bot.
Jumping : botin.
Ivory : folul.
Just : guri, murg.
Justice : bud, gurr.
Juvenile : burbar.

K.

A keeper : hain.
A kettle : disdi.
A key : muftah (Arb.)
A kick : dumbabid. Of a camel or man : hurrati.
To kick : dumba, hurrat.
A kid : whar—plural, wharro.
To kill : dil.
Killed by poison : sun ba lesih.
A killer : dillah.
Kind, race, sort : tul.
A kiss : dunkashu, dunku.
To kiss : dunkan.
I will kiss you : aneka ku [dunkanaya.
A knee : jilib, rug.
A knife : mindi—plural, mindiyo.
A knot in a rope, &c. : guntin.
To know : akan, or agan.
Knowing : guranaya, akanaya.
Knowledge : ilm (Arb.)
Known : guranaya, wala yakan.
A knuckle : hibna—plural, hibnu.

L.

Labour, work : houl.
Labour, pain, trouble : hunun.
A ladder : sullan.
A lake : bulli.
A lamb : burar—plural, buraro.
Lame : luglo.
Lamentation : ilmu, bohen.
A lamp : suraj (Arb. سراج)
A lance : wurn—plural, wurmo.
Land (region) : mughalo.
Land, nation : dud, dul.
A lane : jid yer.
Language, speech : aff (Amharic.)
Large (wide) : bullar.
Large, big : wen.
Large, abundant : budun.
A lass : ghubr.
Last : dubidi.
Late : rag. You are late : adeka wa ragti.
A laugh : kusl.
To laugh : kusla.
Laughing : kuslaya.
Law : gurr,—rule, custom : her.
Lawful : halal (Arb.)
Lazy : dal.
You are very lazy : adeka wa budun daluntahai.
Lead : resas (Arb.)
A leaf (of a tree) : halen.
A leak, in a ship : hushwud.
Lean, not fat : wed.
To learn : burra.
Learnt : burtai.
Least (adj.) : ka wuda yer.
Leather : san—(hurg, the skin of sheep.)
Leave : idin (Arb. اذن)
Left, not right : bidih.
The left side : dunka bidih.
A leg : bodu, shunsu.
A lemon : len.
To lend (money) : amah.
Length : durrur, dur.
Less : ka yer.
A letter : wurkah (Arb.)
A level, or plain : burhud.
A liar : beinowas.
Liberal : degsi, sakkhi (Arb. سخي)
A lie : bein.
Life : nolol.
Light : iften.
Light (not heavy) : fuded.
Lightning : hilah.
Like (adj.) : sidda, siddas.
Like the sea : sidda budda.
Like a man : sidda ninka.
Like the sun : sidda kurada.
Lime : nurah (Arb. نورة)
Linen : durr.
A lion : libah.
A lip : dibn, bushen.
To listen : mugul.
A load : gad, rur.

Loaded : wa rureyahai.
A loaded gun : bundook shenudun.
Lo ! arug.
A locust : aiya—plural, aiya.
Long (not short) : der.
A long time : beri oreyi.
To look : arug.
To lose (opposed to find) : wayid.
To lose the way : jidki wayid.
Loss : dinan.
Lost : lowa wayidin.
Love : jalan.
A louse : injer.
Low, short : gaban.

M.

Mad : walun.
A mad dog : ae walun.
A maid, maiden : ghubr.
A maid servant : adon.
A main mast : dughal wen.
To make : ful.
A malady : bukan.
Male : lub.
Malice : hulad.
Man, mankind : nin, dud.
The mane (of a horse) : gimmu.
Manner : alakud.
A mansion : agul wen.
Many : budun.
How many people ? inmisa dud ?
Many times : wa murrah budun.
A march : sod.
A mare : geyu (Amharic.)
A mariner : bahri (Arb.)
A mark : sumud.
A mark, butt for shooting at : dugtun.
A market : sogh (Arb. سوق)
Marriage : gur.
A marriage portion : mehr, dibad.
Married : gursutti.
A married woman : nag gursutti.
To marry : gurun.
A mart : mughalu.
Masculine : lub, lubod.
A massacre : dughal, dillin.
A mast : dughal.
A master : sahib (Arb.) yaleh.
A mat : durmu—plural, durmoyin.
A match (of a gun) : lifah.
Meal, ground corn : bur.
Mean, despicable : hun.
Measure : kyas (Arb.)
Measure for corn or dry goods : kil (Arb.)
Meat (flesh) : helib, huddu.
Medicine : dowa (Arb.)
A meeting : fuddi.
A melon : hunun.
A water melon : hunun.
Men : dud, nimun.
Merchandise : buzahah (Arb.)
A merchant : tajir (Arb.)
Merciful : degsi, rahim (Arb.)
Mercy : degsi, rahm (Arb.)
The meridian : zuhr (Arb.)
Merry : rehren.
A message : duren.
Mice, plural of mouse : jir wen.
Midday : zuhr (Arb.)
Middle : dehdahad.
Midnight : gelen deha.
Midst : dehdoda.
Milch cow : sa-ah.
Milk : hanu.
To milk : liss. Have you milked the cow ? adeka sa-ah ma lissti ?
A mill : midhin.
The mind : nyet (Arb.)
Mine (poss. pronoun) : ana aleh.
A mirror : murayad (Arb. مرآة)
Mischief : khasarah (Arb.)
A miser : bakhel (Arb.)
Misery : musebah (Arb.)
Misfortune : bila (Arb.)
To miss (the mark) : lowa.
Mist : hero, heryamu.
A mistake : gedmis.
Mixed : isku duren.
A mob : shir.
A model : ae nah (Arb.)

Modest, bashful : hagog.
Modesty : hishot.
Moist, humid : jilaya.
Money : lagh.
A monkey : dayer.
A month : bil—plural, bilo.
Two months' : lubah bilod.
The moon : dayah.
Moonlight, moonshine : iff dayah.
More : budun, ka budun.
More or less : ka budun musowa ka yer.
The morning : fajr (Arb. فجر)
Most : ka waza budun.
A moth : bulunbalis.
A mother : hoyo, hubr.
To move : dughagis.
Moved : duddugha.
A mountain : bor—plural, boro.
A mouse : jir yer.
The mouth : aff (Amharic.)
Much : budun.
Mud : dobu.
A mule : bughl (Arb. بغل)
Murder : dimai.
To murder : dillai.
Murdered : dil dimaya.
A murderer : dilla.
Musk : subad (Amharic.)
My : kaigi, daidi.
Mute : hamus.
Myrrh : mulmul.
Myself : nuf (Arb. نفسی)

N.

A nail (of the finger) : hidiyo.
A name : muga.
Narrow : yer.
Nasty : hun.
A navel : hundur.
Nay : maya, meha.
Near : dowan.
Necessary : layelo.
Naked : gawan.
The neck : gor—plural, goro.
A necklace : awdulli.
Need : dun.
A needle : irbud (Arb. ابرت)
Needy : bahnai.
A negro : huboosh, bidod.
To neigh, horse : dumun.
A neighbour : deris.
Nephew, brother's son : in ader.
A nest : bul.
A net : shibik (Arb. سبكة)
New : huseib.
News : wur (Ambaric.)
Nigh : dowan.
Night : huben—plural : hubeno.
A dark night : huben gudora.
Last night : hali.
A moonlight night : hubenki dayah.
Nine : sugal.
No : meha, ma jirtu.
Nobody : idna ma jirtu.
There in nobody at home : agulki idna ma jogtu.
Noise : gheila.
Noon : zuhr (Arb.)
Nor : munna.
Never : goro maya.
Never mind : ha hamen.
Nothing : wahba.
Now : aminka.
Number : tirro.
Not : ma jirtu, ma jogtu.
The nose : sŭn.
Nineteen : sugal ya tuban.
Nineteenth : sugal ya tobnadka.
Ninety : sugashun.
A great number : tirro budun.

An oar : sayib (Arb.)
An oath : dar.
To obey : ugul.
To obtain : hela.

The ocean : bud wen.
Off, far off : fug.
An offence : human.
Oil : sulet (Arb سليط)
Old : gubbo—an old man, uddai.
An omen : fal (Arb. فال)
On : dusha.
Over : dusheda.
One : kan mid, kilya.
One man : ninkilya. One woman : nag kilya.
Every one : wa wulba.
One night : huben kilya.
Open : furun.
Or : musowa.
An ostrich : goraya.
Other : mid kulli.
Over, to pass over a river : kalabai.
Our : anika aleh.
Out, not within : dibudda.
An outrage : zulm (Arb.)
To owe : gan.
An owl : shunbirliba, hubus.
Own, my own : kaigi, taidi.
An owner : ninki leha.
An ox : dibbi—plural, dibbiyo.

P.

A pace : talabu.
A page : bal.
Paid : sehi.
Pain : hunun.
A pair : ikanshu.
A palm tree : dom.
Paper : wurkud (Arb.)
Pardon : affu (Arb. عفو)
To pardon : affi.
A parrot : durrah.
A part, piece : hagoin.
A partner : shureek (Arb.)
To pass : tugh.
Passion : hardo.
Past, not present, gone : tughai.
A path : jid yer.
A pawn : hulad.
To pawn : huladun.
To pay : bashi seh.
A pearl : lul (Arb. لؤلؤ)
A pen : kulm—plural, kulmo.
Penury : bahan.
People : dud.
To perform : fullun.
Peril, danger : bugdin.
Perpetual : kul wulba.
A person : nin.
Perspiration : dididi.
To perspire : dididun.
A petition : bebesi.
A physician : tabib (Arb.)
A pig : dofar—plural, dofaro.
A pigeon : morro.
A pilgrim (to Mecca) : hajji.
A pillow : burkimo.
A pimple : hurarud.
A pin : kulab.
To pinch : hundofu.
A pirate : wahabi.
A pit : god—plural, godud.
Pity : rahmud (Arb. عفو)
Place : mel, degmo.
From another place : deg makulya.
To place : kudda, iskudda.
A plain ; bunan.
A plank : loh (Arb.)
To play : aiyar.
Pleasure : rehren.
Plunder : dah. They plundered : aigu dehai.
A pocket : kis (Arb. كيسة)
A point : haro.
Poison : (dunkal, a vegetable) : wabaya, the poison which is applied to arrows.
Poisoned : wabayu ledahai.
A pomegranate : ramman (Arb.)
A pond : bulii.
Ponderous, heavy : hulus.
Poor : dugag, miskin (Arb.)
A portion : ghaib.
To possess : aisitta jirrah.
Possessed : wa haiya.
Possession : haiya.

Possible : wa nugda.
A pot : disdi.
Poverty : dugag.
Poultry : doraya.
Powder : amod, arro.
Power : tag, hog, hital.
Powerful, strong : wa hog.
Praise : mahud (Arb. حمد)
Pregnant : horleh.
Preparation : sumay.
Presence : helin.
Present, not absent : jog nin.
The present year : sunnahdi.
Ready money : lagh.
A present : bishahrad, bakshish.
Pretence : helud (Arb. حيلة)
Pretty : ghuru.
Price : ghunna, lusiah.
High price : ghunna budunta.
To prick : tulin.
Pride : kibr (Arb. كبر)

A quadruped : muwashi.
Quantity : inmisa jirrah.
A quarrel : human.
Quarter : wah.
Quarter of a city : hafah, berba.
From every quarter : berba wulba.
To quench (fire) : bukti.

A race : hul, tul.
A raft : rams (Arb. رمث)
A rag : kurren.
Rage : hurro.
Raiment : durr.
Rain : rob.
To rain : roban.
To raise : kad.
A ram : wun.
Ran, pret. of run : arrur.
Rapid : dukso.
A rascal : tugh.
A rat : jir—plural, jirrur.
Raw : herin.
A razor : mus, mundil.
Ready, at hand : wa jirra.
A rebel : a si (Arb. عاصي)
Rebellion : billayo.
A prison : hubsi (Arb. حبس)
A prisoner : hubsaiyahai.
Procurable : helin.
To procure : helai.
Prodigious : yab.
Profit : nafa (Arb. نفع)
Profitable : faidu (Arb. مفيد)
Progeny : wilul.
To prohibit : helin.
Prohibited : helinaiya.
A promise : bullun.
Proof : murg.
Proud : kibri.
To provide : sumai.
Provisions : sor.
A pumkin : pompion, ubboi, dullo.
Punishment : idib.
Purpose, intention : murad (Arb.)
To push : rehnin.
To put : lay, dig.
To put to death : dillai.

Q.

A question : wedin.
Quickly : dukso.
Quiet : fuddi, degmu.
A quill : bal.
Quite : muwudda.
A quiver (case for arrows) : gaboya.

R.

To receive : hubso gado.
A receipt : wurkud esih.
A recompense : shukko.
Red : asan.
A reed : dor kusub (Arb. قصب)
Refusal : helin dedu.
To refuse : helina dedun.
Region : mughalo.
Regret : hummi.
To reject : helina.
Rejection : helin.
Rein (of a bridle) : hakaina.
Relief : hil.
To relieve : hili.
Religion : din (Arb.)
To remain : fuddi.
Remainder : wa yal, wa fuddi.
Remedy : hilak.

To remember : hasoso.
Remembrance : hasos
Remiss : sijed, tabsun.
Remote : fug.
To remove : guren.
Removed : la gur.
Renown : namus (Arb.)
To repose : seho.
Reply : haiya.
To reply : erid.
A reproach : hai.
A reptile : mus, bahalos.
A repulse : helin.
Repulsed : helinaya.
A request : dua (Arb. دعا)
To require : doniah.
Requisite : dun.
To reside : fuddi, degu.
Residence : degmu, agul.
To resign : heri.
Resistance : helin.
Rest, quiet : rahah, ludnan.
The rest, remainder : hudnin.
To return, give back : esih, heli.
To return, send back : huder.
Revenge : kisas (Arb.)
To revenge : kisaski kakada.
Reverse : rugnin.
A reward : shukoh.
A rib : fer, fero.
Rice : beris, berid.
Rich : hodun.
Riches : houl budun.
To ride : ful. I rode the horse : aneka furus ka fulaya.
A rider : nin fulai.
Right, fit, proper : wa nag, jirren.
The right hand : midig.
Right and wrong : kih wa nuksun kih hun.
A ring : khatim, madur.
Riot : daghal.
Ripe : biseil.
Risk : bagin, habsun.
A river : durdur.
A large river : durdur wen.
A road : jid—plural, jidud.
To roar (as a lion) : hein.
To roast : dub. Roast the meat : helibka dub.
To rob : hud. He robbed me : husugga ega hud.
Robbed : tughu, hudai.
A robber : tugh, hudde.
Robbery : tughu.
A rock : bor—plural, boro.
A rogue : tugh, herka gohi.
A root : dehan.
A rope : herig.
A ship rope : herig—plural, herko.
Rough : adeg.
Round : helka, gobo.
A rub : dugnin, hugnin.
Rubbish : kushash (Arb. مغرب)
A rudder : shukan.
Ruin : haid.
Rule, government : gurr.
To run : arrar, horud.
Rust : mirid.
Rusty : miridai.

S.

A sack, for corn : kolai.
Sad : hummi.
A saddle : korah.
Safe : nubud.
A sail : shirah (Arb. بالل)
Sake, end, purpose : durar.
For the sake of : waha durardisi.
Sale : ibi, ibsa.
Salt : usbooh.
Salt (adj.) : wa usboohsiyahai.
Same : iskomid.
Of the same colour : wa isko midhub.
At the same time : kulki.
A sample : ayinah.
Sand : amod.
A sandal : kubbo.
Sap, of trees : dehan.
Satan : sheitan.
To satisfy : gulisi.

To save : hayu.
God save you ! Allah ka hayu.
Saw : arkai. I saw ; aneka arkai.
A saw : minshar (Arb.)
To say : leda uri.
A scar : dub gon.
Scent, odour : hur.
A scorpion : angarunli, dubkullo.
A scoundrel : tugh, nin hun.
A scout : illalo.
Scum : usgug.
The sea : bud.
On the sea shore ; hebta jirrah.
By sea and land ; bud aiyu beriga.
Sea coast ; hebta.
A sea fowl ; shimberro.
A seaman ; bahri.
A sea shell ; senayu, suduf (Arb.)
A seal ; khatim (Arb.)
To search ; donis, baris.
A secret ; hudl kursi, kurdodi.
Secretly ; kursasho, gursasho.
To see ; arkai.
See ! behold ! arug ! aruk !
Seed ; ber, berti.
To seek ; donis.
Seen ; arkaiya.
Self, myself ; nuftaidi (Arb. نفسي)
To sell ; ibi.
To send ; dur.
Sent ; durai.
A sepulchre ; hubal.
A serpent ; mus—plural, musus.
A servant ; khadim (Arb.) [adono.
A maid servant ; adon—plural,
Service ; houl.
To set ; dah.
Seven ; tudobah.
Seventeen ; tudobah ya tobun.
Seventh ; tudobahda.
Seventy ; tudobahtun.
To sewer ; gohi.
Several ; budun.
To sew ; tul. Sew the cloth ; durrka tul.
Six ; liyah. Six men ; liyah nin.
Shade ; hud.
A shadow ; hud.
To shake ; lulul.
Stinking ; gurrun.
Shallow ; beha yer.
Shame ; hishod.
A share ; ghaib.
Sharp ; aff budun.
A sharp sword ; seif aff budun.
To shave ; heren.
She ; aida, aiza.
A sheath ; gul.
A sheep ; ari—plural, ari.
A shepherd ; arijirrah.
A shield ; gashan.
A ship ; doni—plural, doniyo.
To go on board a ship ; donida tugh.
To unload a ship ; rerki karogay.
The anchor of a ship ; burosi.
A shoe ; kub—plural, kubbo.
To shoot (throw or dart) ; rid.
A shop ; dukan (Arb.)
The shore, sea shore ; heb.
To go on shore ; hebta tugh.
A shot ; rasas (Arb.)
The shoulder of a man ; gurb.
To show, exhibit ; tus.
A shriek ; gailo.
To shut ; heli. Shut the door ; albabki heli.
Shut ; heleyahai, hereyahai.
Sick ; buka.
Sickness ; bukan.
A side ; burbur.
The right side ; burburka midigta.
Sight ; daimu.
A sign ; sumud.
Silence ; hamus.
Silver ; lagh.
Similar ; iskomid.
The sun ; kurah.
Since (from that time) ; gorta.
To sing ; hes. I sing ; ana heseya.
Single ; mid.
A single time ; mid kilya.
To sink (in water) ; kubukti.
A sister ; wilal. My sister ; wilashi.

To sit : fuddi.—Imper. furiso.
Sitting : fuddiya.
Six : liyah. Sixteen : liyah ya tobun.
Sixth : liyahda, Sixtieth : liyah dunadka.
Skin (of a man) : dub, san.
Skin of a sheep : hurg.
The skull : mudha.
The sky : her.
A slave : bidah. Female slave : adow.
A slave merchant : adomo yibshi.
Slaughter : dillin, geri.
To sleep : urdo.
Sleepy : lulo, urda.
Slow : edir.
Small : yer.
Small pox : furog.
Smell : hur.
To smell : hurso.
A smith, blacksmith : tumal.
Smoke : geg.
A snake : mus—plural, musus.
A snare : dubin.
To snore : khoro.
Snow : heryamo.
So, in like manner : wa siddas.
Soft : jilleya.
Soil, earth, ground : dul.
Sold : leyibi.
A son : wil. Son's son : wilkagi wil.
A song : hes.
Soon : duksa.
Sorrow : hummi.
Sore (as a wound) : hunun.
The soul : nuff (Arb. نفس)
Sour : dunan.
The south : kabafoor.
To speak : hudl.
A spear : wurun—plural, wurmo.
Speech, language : hudl, aff. Amharic.
Speedily : dukso dukso.
To spend : ghaibi.
A spider : arro.
A spy : illalo.
To stab : warem.
A stab : warm.
A staff : hul—plural, hulo.
A stake : didb.
To stand : jog, jogsu.
Standing : jogai.
A star : hedig—plural, hedigo.
To starve : gajo dimo.
Steel : bir lub.
Stench : kurun, gurun.
A step : talabo.
Still, quiet : howal, fuddi.
Still (until now) : wulli.
A sting (of a bee) : geneyu.
A sting of a scorpion : geneyu angarunli.
A stirrup : rikab (Arb.)
The stomach : halol.
A stone : dagha—plural, daghayo.
To stop : jog.
A storm, tempest : dubel wen.
Straight (not crooked) : tos, tosun.
Strange : ghureb (Arb.)
Strength : tagh, hog, hital.
To strike : kudifo.
A string : herig.
A bow string : bogun.
To strip, make naked : iskagi.
Strong : hogbudun. A strong man : ninhog budun.
Stung (by a bee) : wali geneni.
Stupid : walun, akl yer.
To suck : nugmu.
Sugar : sukr.
The sun : kurrah.
Sunrise : kurahdi sobadi.
Sunk, immersed : kubukti.
Supplication : du-a (Arb.)
To swim : dubal.
A sword : seif. (Arb.)

T.

To take : ho, gubso.
To take away : seyakad, uge.
To take care : iskogo.
To take an oath : daro.

A tale : sheku.
To talk : hudl.
Tall, lofty : der.
A tank : bulli.
A tax : bad, ashor (Arb.)
To teach : baro. I taught you : ana ku burrai.
A tear : ilmo.
Teeth (plural of tooth) : ilko, ilgo.
To tell : hudla.
Ten : tobun. Ten thousand : tobun kun.
A tent : kheimud (Arb.)
Tenth : tobnadka.
Terror : bugdin, absi.
Testicle : henayu.
Than : ka, kai.
That : wahas.
For that reason : waha durardi.
At that time : gorti.
From that place : meshoka.
On that account : wahas durardisi.
Theft : tughi.
Their : kodi, hodi.
Then : gorti, kulki.
Thence : meshoka, hulko.
There : mesho hulka.
Here and there : hulki ya hulko.
Therefore : waha durardi.
These : kowas.
Thick : boraiyahai.
A thief : tugh.
A thigh : bondu.
Thin : garayer.
Thine : zaleh.
A thing : waha.
Third : sadahda.
Thirst : hurrad.
Thirsty : hurradaiya.
Thirteen : sadah ya tobun : thirty, sudun.
This : waha, wahas.
A thorn : kuda.
Thou : adeka, adega.
A thousand : kun.
A thread : dun, dob.
Three : sadah. Three hundred : sadah bughul.
The throat : huno, hunguri.
To throw : rid.
Thunder : unkud.
Thus : wa siddas.
Thy : kagu, dadu. Thy house : agulkagu.
Tide (of the sea) : mayud.
Ebb tide : budwaari. Flood tide : wa buhu.
To tie : hed.
A tie, a knot : guntin.
Till : nilli. Till this day : manta nilli, or manta horted.
Time : gor zaman (Arb.)
At all times : gorwulba.
To : ki. To him : husugga.
To-morrow : beri.
Tobacco : bori.
A toe : furro.
Together : le (I will sail with you : aneka ken le dofaya.)
A tomb : hubal.
The tongue : arrub.
A tooth : ilig. The two front teeth : folul.
A tortoise : gadarah.
Total : idilkod, damantod.
A town : mughalu.
Trade : houlu.
A trap : dubin.
To travel (by sea : dof)—by land : son.
A tree : ged—plural : gedud.
A tribe : tul—plural : tulul.
A trick : khyanah (Arb.)
True : wa ruma, wa run.
Truth : wa run.
Twelve : lubah ya tobun.
Twice : lubah ghorod.
Twenty : lubatun.
Two : lubah.
A tyrant : zalim (Arb.)

V. U.

A vagabond : nas, douder.
A valley : tug. A large valley : tug der.
Value : lusiah ghuna.
Valour : gezi.
Vast : banan.
An udder : ando.
A vein : hidud.
A veil : hajab (Arb.)
Vengeance : kisas (Arb.)
Venom : wabayu.
Venomous : wabayu leyaha.
Very : budun. Very good : budun wa nuksun.
Ugly : hummawi.
Vice : billo.
Vile : hun, wa hun.
A village : mughala yer.
A viper : mus wabayu leyahai.
A virgin : ghubr.
An ulcer : bog—plural : bogo.
Unarmed : hublawa.
An uncle, paternal : ader.
An uncle, maternal : abti.
Under, beneath : osta.
To understand : gurun.
Unfit : abal.
Unfortunate : aiyan durun.
Unhappy : hummi.
Unjust : gurun hun.
Unkind : nahris lawa.
Unripe : ma bislanin.
Unsafe : nubud ma jirto.
To untie : fur.
Until : ya.
Untrue : bein.
Void : murn.
To vomit : muntug.
A vow : bullun.
A voyage : sohtu.
Up : dusha, dushish.
To go up : dusho ubah.
To bring up : dessho geh.
Upon : dushisa.
Urine : kadi.
Us : anika.
Use : terai.
Useful : ter.

W.

Wages : mashahrah (Arb.)
The waist : subr.
To wake : berarigo.
A wall : durbi.
To want : doni. I want : ana doniah.
Want, wish : murad, hamud.
War : daghal.
Warm : kulel.
Was : wa jogai, wa jirrai.
To wash : mairo, maido.
Waste, desolate : hedla.
To watch : illali.
Water : beha.
Salt water : beha buded.
A water carrier : beha siddi.
A wave : mojud (Arb. موج)
A way : jid—plural, jidud.
Every way : wawulba.
In the way : jidka.
We : anika, anaka.
Weak : wed. A weak man : nin wed.
Wealth : houla budun.
Wealthy : houdun.
Weary, fatigued : dal, dalai.
To wed, marry : gursu.
To weep : ilmu, bohin.
Weight : mezan (Arb.)
A well : hel—plural, helul.
The west : mughrib (Arb. مغرب)
Wet : jillai.
What : mahad maha.
Of what sort ? wa tulmah ? wa aen ma ?
What can I do ? aneka maha, 'fulla.
When : hudmah, gormad.
Whence : huge.
Where : meha, mel mah.
Every where : mel wulwa.
Which : kee.
A whip : jedul.

White : adan, atan.
Who : aiya. Who are you ? adeka aiya ?
A whore : dillo,—plural, dilloin.
Why : wayu, mahad.
A wife : nag. My wife : nag taide.
Wind : dubel.
A wing : balul. (Arb. شراع)
Wisdom : herib.
With : le.
I went with him : aneka le sodai.
Within : guda.
Without, outside : dibbuddi.
Without reason : subub lahan.
Without hope : helid lahan.
A wolf : wuraba.

A woman : nag—plural, nago.
A married woman : nag gursutti.
A woman in child : nag horli.
A barren woman : nag ghol.
Wonder : yab.
Wood : koryo.
Wool : doghur.
A word : hudl.
To work : sumai.
A worm : dehri.
A wound : kon, gon.
A sword wound : gonti seifta.
A spear wound : gonti wurnka.
The wrist : hurhur.
To write : kor, gor.
Written : korun.

Y.

A year : sunud. Two years : lubah sunuhdod.
Last year : kubori.
Every year : sunud wulba.
Yellow : maren.
Yes : waiyahai, ha.
Yesterday : shullai.
Yet, hitherto : willi.
You : adinka.
Young, youthful : burbara.
Youth : burbar.
Your : adinka aleh.
Your houses : agulla deni.
Your father : aba hin.

Z.

A zebra : furro.

ART. XII.—*A Catalogue of the most remarkable Hailstorms which have occurred in India betwixt* 1822 *and* 1850. By Dr G. BUIST.

THE skeleton of the following paper was laid before the Geographical Society on the 22nd September 1849 : it was directed to be published in the newspaper reports as it stood, and afterwards to be inserted in the *Transactions* after all the additions to and fillings-up for it that could reasonably be expected had been received. As it is, it still remains a skeleton, containing accounts in all likelihood of not more than a third or fourth of the remarkable Hailstorms which have within the last thirty years occurred in India. It is, at the same time, believed that but a small number have been omitted of those of which published accounts exist, and we must therefore now look forward to a much more ample and complete system of meteorological observation than any we have hitherto possessed, to give us from this time details of all the more remarkable phenomena that make their appearance. The list of Hailstorms in India was prepared with the view of obtaining the elements of a much more satisfactory theory of the fall of hail than now exists ; and the phenomena presented are sufficiently remarkable. The first o

these that strikes us is the remarkable sizes of the pieces of ice which fall in India compared to that of the hailstones of Europe:—the latter rarely exceed beans or filberts in magnitude—the former seldom are less than marbles, and are often larger than apples or oranges. We have two instances of masses of ice some hundred weight in size, having fallen in India—we have one of a mass of similar dimensions having allen in Europe,—so that in this there seems no particular dissimilitude betwixt the two. There is no account of the occurrence of hail within 1000 feet of the level of the sea south of lat 20°, though just to the north of this hailstorms are very abundant, and they occur very frequently south, as far as Ceylon, at altitudes of 1700 feet and upwards. They seem most frequent in February and May—rarest during the rainy season.

HAILSTORM AT MEERUT ON THE 9TH NOVEMBER, 1781.

Advices from Meerut, 25th November, mention the occurrence of a dreadful hail storm on the 9th, in the neighbourhood of that city. Its range was very extensive, and it is said to have done great mischief, killing men and cattle, and rending many young trees to pieces. The hailstones weighed generally from two to ten pounds, and it was reported on the authority of a respectable native land-holder, that one single mass of ice on being weighed was found of the enormous magnitude of eleven cutcha seers, about three hundred ounces.

HAILSTORM NEAR BANGALORE, ON THE 10TH APRIL 1822.

"On the 11th inst. a Brinjarah came in and reported that on the preceding night, about half-past eleven o'clock, a thunder-storm took place, succeeded by a heavy shower of hail from the north, which continued with destructive and unabating violence for two hours, between the villages of Goordhully and Buggulcondah, where the whole of their Sondah bullocks, that came with the grain from the Ceded Districts, had perished, and that two men had been nearly killed. The hailstones were represented to be about the size of full grown pumpkins; some said 'men's heads.' (and the villagers had magnified them to an enormous size, having probably made the examination, and given the description of hailstones united into masses). On the night of the 12th, another Brinjarah came to corroborate the above report, with the exception that eighty instead of 150 bullocks were killed outright; the remainder having been so benumbed only, previously, that they had been given up for dead. On the 13th I repaired to the spot, where the carcases of twenty-seven bullocks bore evident marks of having been severely lacerated and killed by hailstones. The weather sides of every tree in the topes were stript of their leaves and bark, and hundreds of unripe mangoes lay smashed on the ground, several cleanly cleft in two; many birds were also lying dead on the ground. On the road to a tank or guntah, about a quarter of a mile from the jungle, where the Brinjaries had encamped, there were several dead animals. Half of the surface of the tank (about 300 yards in circumference) was completely covered with large floating masses of hailstones carried down deep ravines from the high ground two days before, but then collected in so solid a state of congelation, that I stood upon one of them for half a minute before it began to give way. Some of these masses were five inches and a half in thickness, when broken with sticks and brought ashore; after being exposed for a short time to the sun, the hailstones quickly disunited. The largest I saw measured three inches; they were chiefly of angular and oval shapes, and perfectly transparent. In one of the masses a snake was found quite stiff, and, to all appearance, lifeless: but he revived when extricated from the ice. As the sun set, the cold became very intense, though its degree could not be ascertained in the absence of a thermometer. However, two earthen vessels full of the hailstones were brought away, and their contents retained more than ordinary bulk, after being conveyed upwards of ten miles."

"You may have some idea," continues the writer of the account, "of the size and solidity of the pieces which fell, when I tell you that I had a large chatty full of them brought to me to-day (the 16th), and some of these are still an inch in diameter. I have sent for some aloe leaves, which I hear are perforated by the hail as if they had been exposed to a cannonade of round and grape shot."—*Madras Government Gazette, April* 25, 1822.

HAILSTORM NEAR MONGHYR ON THE 24TH FEBRUARY, 1823.

We learn by a letter from Patna, dated the 7th of March, that from the 24th of Feb. to 1st of March, they experienced in that quarter a cloudiness, heavy rain, with a violent storm of wind; but had only a fall of rain at Patna. On the north bank of the Ganges, particularly towards Tirhoot, in direction extending four cosses in breadth, from the stage of Etbar Khan to Pudmoal,

and four cosses in length from Mozuffurpoor to Monghyr, it rained far more heavily, accompanied with such a tremendous hailstorm, that the hailstones were three or four seers in weight. Hailstones of this description have of course destroyed all the crops there, such as wheat, barley, mussoor-gram; people's houses have been broken down; pease and boot-gram cannot be seen. Five men have lost their lives. The rains have occasioned an increase of water in the river, and have not quite ceased yet. If the rains and storm continue so for three or four days longer, this part of the country, it is supposed, will suffer a total inundation.—*Sumachar Durpin, March*, 1823.

HAILSTORM AT KAMPTEE ON THE 3RD JUNE, 1823.

Thunder and Hail Storm.—(From a letter dated Kamptee, near Nagpore, 4th June, 1823)—"Yesterday, about half-past 2 P. M., a most violent thunder and hail storm came on here from the N. W., which did considerable damage throughout the cantonment. It suddenly changed to the N. N. E., and continued blowing with unabated fury for three quarters of an hour. Some of the oldest officers in the station say that they never experienced a storm equal to it, at any place in India that they have visited. Nearly the whole of the out-houses of the different bungalows were blown down, and the hospital of the 1st batt. 21st regt. N. I. was levelled with the ground, and the sick that were in it at the time had as much as they could do to escape out of it previous to it falling. I have been many years in India, and I never saw hail equal in size to those of yesterday; without the least exaggeration they were as large (if not larger) as the egg of a young pullet. Three horses belonging to officers at the station were killed by the stables falling upon them, while they were bound and held fast with head and heel ropes; but this must evidently have been the fault of their Saees, who might have taken them out of the stables before the storm came on. Considerable damage was done to the stables of the 8th Native Cavalry (none of the horses injured), as well as to some of the Hon. Company's public kutcha buildings at the station."—*Cal. Jour.*, *June* 20, 1823.

HAILSTORM AT LOHARGONG ON THE 9TH FEBRUARY, 1825.

Letter from Lohargong, dated Feb. 12.—On the evening of the 9th instant, this station was visited by one of the most severe thunder storms in the recollection of the oldest inhabitant of the place. Clouds of most portentous appearance prevailed during the day. About 7 P. M. hail, not less in size than a pigeon's egg (I speak within compass), accompanied by a violent wind from the S. W., electrified the station. Tents were blown down, huts unroofed, and the crops most seriously damaged. Of those that suffered most, I may mention our commandant, Captain Lucius Smith, who that evening gave a party to Mr Ainslie, the governor-general's agent, on his arrival at the station. The first damage was occasioned by the above mentioned *pigeons' eggs* making their appearance in the dining-room, through the glass doors, which were demolished in a few seconds. The wind at the same time burst open the doors from their bolts, and nearly proved destructive to the table-shades, argand lamps, &c. in the room. Gentlemen and servants flew to their aid, and thereby prevented our being left in total darkness. The storm continued nearly half an hour and then abated for a time. About 11 P. M. we had a repetition of it, the wind blowing with the greatest fury. A strong double-pole tent, belonging to Mr Ainslie, was blown down, much to the annoyance of the inmates, who were forced to seek for shelter through the pelting showers in the nearest bungalow. Our feelings at this moment can easily be conceived, but not described. The wind was so violent that it was doubtful whether the bungalow would shelter us for any length of time, and we might once more be exposed to the mercy of the contending elements: much to our satisfaction, however, the storm ceased about half-past 12 A. M.; we were allowed a short repose. At 3 A. M., hail for the third time fell—the wind blowing throughout the night from every point of the compass. The darkness was intense, and we had constant heavy rain. The peals of thunder at intervals were awful; but until 6 A. M. no material accident occurred. About that hour, for the fourth time, the storm raged with unabated violence; the hail, though of less dimensions, fell with pitiless rigour; and at this time the bungalow occupied by Captain Smith was struck by lightning and set on fire. I need not inform you, that it was with feelings of no common satisfaction I saw the only lady (of which this wilderness can boast) perfectly safe, after this dreadful accident. The lightning struck through the centre of the chopper and appears to have spread in four different directions. The effects of it were distinctly visible on the walls of four rooms. In the hall several servants were knocked down from the shock, but fortunately none of them sustained material injury. There was little cessation of rain during the whole of the 10th and following night. A material and delightful change in the state of the weather has ensued; and broken tiles, roofless huts, shattered windows, and the ruination visible in our gardens, alone remind us of the anxious moments we passed during the night of the 9th.—*Cal. Govt. Gazette.*

HAILSTORM AT BHOPALPORE ON THE 9TH FEBRUARY, 1825.

Extract of a Letter, dated Bhopalpore, Feb. 10, 1825.—"We arrived here on the morning of the 9th inst., after a comfortless march from Kamptee, and were particularly struck with the beauty

of the scenery, which is romantic in the extreme ; and we cannot think why the place has been so much abused by the gents, who have hitherto had the felicity of residing here. On the evening of our arrival a dreadful storm of wind and rain, accompanied by hail-stones, burst from the clouds ; the hail-stones were the largest and most extraordinary ever seen, some of them being as large and as heavy as goose eggs, to which articles, in shape, they bore a very striking resemblance." —*Calcutta John Bull, March* 10,1827.

HAILSTORM AT SOUTH GOSTH, IN BENGAL, IN MARCH, 1825.

Hailstones.—A heavy shower of hailstones, which lately fell near South Gosth, attended with a thunder-storm, threw down several of the buildings, and caused great injury to the inhabitants. At Chamnapoor, *nine* persons lost their lives by houses thrown down upon them. The weight of each hailstone was weighed to be something more than half a seer.—*Kowmoody, April* 2, 1825.

HAILSTORM AT SERAMPORE IN MARCH, 1827.

" *Serampore, 30th March*, 1827.—Last Thursday night, at a quarter past ten o'clock, a severe storm, accompanied with a heavy shower of rain with hail-stones, fell in Serampore, and lasted for almost an hour. The stones were uncommonly large, so much so, that each of them was equal to the size of a goose's egg, and pouring down in abundance with a tremendous sound. The effect has injured, too, many of the branches and leaves of every tree in my garden ; small mangoes and leeches were destroyed at a great rate, and very few left on the trees : in fact, I do not think there will be any fruit this season. My gardeners were employed sweeping all the part of the garden from six this morning until six in the evening. The stones were gathered with each other, and their appearance were similar to a large stone of one or two maunds weight ; all were melting through the night and the whole day to-day : on the whole, I never experienced anything of the kind in my life, and it was a most shocking event that happened. Pillars, walls, windows of some of the puckah houses, were injured, besides the loss of the huts and choppers of many poor classes, which is beyond extremity."—*Calcutta Chronicle.*

HAILSTORM AT THE SINDOLE GHAUT IN MARCH, 1827.

Extract of a letter dated Camp Mhow, 12th March, 1827 :—

" I have just returned from the Sindole Ghaut with Col. S. : it is twelve miles from this, and during the time we were there we had a dreadful storm of thunder, lightning, and hail, which lasted for two hours. But to give you some idea of the quantity of hail which fell, I may mention the circumstance of our having collected it in tubs and cooled our wines with it : I never witnessed such a storm either at home or in this country."—*Bombay Courier, April* 5, 1827.

HAILSTORM NEAR KOTAH ON THE 5TH MARCH, 1827.

Letters from Kotah of the 8th March, make mention of the occurrence in its vicinity of a hailstorm of most extraordinary violence. It came on with a furious north-wester on the afternoon of the 5th, and broke over a village called Nundna, and the adjacent country for two or three miles round. The hail-stones were reported to have been as large as a man's fist, and on the second morning after their fall they were seen of the size of pigeons' eggs. The most decided proof, however, of their magnitude is the destruction dealt by them, as not only birds and the smaller animals, as goats and sheep, were killed in vast numbers, but horned cattle and human beings perished. In the village of Nandna alone six persons were killed, and seven others were dangerously bruised. Extensive mischief was also done to the cultivation, and many hundred acres were laid waste.—*Calcutta Government Gazette.*

HAILSTORM AT CALCUTTA ON THE 26TH APRIL, 1829.

Calcutta was visited yesterday evening by one of the most severe thunder-storms ever experienced here, we believe. It commenced between the hours of six and seven o'clock, accompanied by a very heavy squall from the south-east, by a copious shower of rain and a fall of hail, and lasted more than an hour. The thunder was awfully loud and reverberating as if among rocky mountains, the loud crashes following each other in rapid succession, and the forked lightning, gleaming from pole to pole, with terrific brilliancy and grandeur, seemed even while we gazed, as if it were dealing death and destruction around the land. Several natives were killed, and several escaped almost miraculously. The hail-stones surpassed in size anything we ever saw or heard of ; one was brought to us which was larger than a duck's-egg. We saw and had collected many of the size of pullet's-eggs, and the average size of all seen by us was that of children's marbles. A sketch of one picked up by a military officer was sent us to-day, of a nearly oval form, measuring two inches and a half by one and a half diameter, and three-quarters of an inch in thickness. Some of those we saw, however, were not at all of a round or

spherical form, but quite and angular, like pieces of stone broken off a mass of rock. The wind was the whole time, or nearly so, from the south-east, though the dark clouds in the north-west indicated the approach of a squall from that quarter, and it appeared at one time that there was a conflict between the two winds. The south-east prevailed however.—*Bengal Chronicle, April* 27.

HAILSTORM AT SERAMPORE IN APRIL, 1829.

In a thunder storm, which occurred in April last year at Serampore, some hailstones were picked up as large as a hen's egg. They were observed, when broken, to have a concentric lamellr structure, being formed of successive layers similar to the coats of an onion! The nucleus was of a whiter colour than the exterior.—*Gleanings of Science.*

HAILSTORM AT SYLHET ON THE 19TH FEBRUARY, 1830.

Sylhet, Feb. 20, 1830.—"The weather for several days has been very wet, and yesterday, between the hours of one and two P. M., we had a most extraordinary shower of hail-stones, such as I never witnessed before, either here, where it is very frequent, or any where else. It commenced as usual, but soon the stones began to increase in size (*equal to the largest potatoes*), and to fall on all sides of us in such quantities, and with such rapidity and violence, that I naturally concluded not a single leaf would be left on a tree. Our large premises seemed like a sheet of white stones, *lying* thick and tumultuous, and presenting to the eye an unusual and grand spectacle. The water of our tanks began to leap high, and the bamboo-net over the thatching of our bungalow flew in all directions. Our garden, as I had expected, has been at once laid waste. Our peas of various descriptions, and our French beans, were found this morning scattered far and wide, most of them shivered to pieces. Of our cabbages not one was left standing entire; but what, above all, is to us a subject of regret, is the loss of our Virginia tobacco plants, of which we had hoped to have a large quantity next year. If we recover a twentieth part of all the seed we had expended, it will be a wonder. We may safely calculate on having no mangoes this year: our own trees have been clean swept of their blossoms, and many of their branches too. About a quarter of an hour after we had another shower of hailstones, but nothing like the previous one. All the natives I have spoken with, declare that they never witnessed such a fall of stones."—*Cal. John Bull, March* 12.

HAILSTORM AT JUBBULPORE, ON THE 9TH APRIL, 1831.

The following is an extract from a letter, dated Jubbulpore, 10th April:—

"On Saturday, the 9th instant, we were visited with the most severe hail-storm that has been known here in the memory of the oldest inhabitant. The hail-stones were some of them full as large as a guinea-fowl's egg, and came down with such violence that some sheep and goats were killed. All the trees have been deprived of their leaves, and several birds have been beaten from the trees and killed. The storm lasted for more than two hours, and the ground remained covered with hail for a long time. All the gardens have been completely ruined, the peaches, &c., being knocked off the trees."—*John Bull.*

HAILSTORM AT KAMPTEE ON THE 10TH APRIL, 1831.

The following is an extract of a letter from Kamptee, giving an account of an extraordinary hail-storm which happened at that place on the 10th April:—

"Just as I was finishing this, the most violent hail-storm I ever saw or heard of commenced; it fortunately did not last long, but the damage done is considerable; we had a number of ducks and geese killed, and the fruit-trees in the garden regularly smashed; the peach crop is completely destroyed. *Many of the hail-stones measured from ten to twelve inches in circumference;* few or none were smaller than a hen's egg. I hear five people have been killed in this neighbourhood by it."—*India Gazette.*

HAILSTORM AT ALLAHABAD AND CHUNAR ON THE 5TH MAY, 1833.

A letter from the neighbourhood of Allahabad gives an account of an extraordinary hail-storm which occurred there on the afternoon of the 5th of May. A hail-stone that was measured was *ten inches in circumference* and *eighteen* Furruckabad rupees in weight (six ounces and three-quarters troy)—the statement being verified by a private letter before us, signed by two gentlemen of high character in the civil service, who further state that there were others larger that might have been selected. They add that, if they were to read such an account in a newspaper, they would hesitate to believe it, and they have therefore done all they could in communicating their names and vouching for the accuracy of the statement.

Another letter, dated Chunar, 6th May, 1833, states:—"We were yesterday visited with one of the most dreadful hail-storms perhaps ever witnessed. During the fore part of the day, the heat was excessive. About noon, from the distant thunder and the appearance of the atmosphere, we were anxiously looking for a small shower to cool us. Between two and three in the afternoon, a

few straggling hail-stones, about the size of a common fowl's-egg, commenced falling. About ten minutes after, the hail, more like blocks of ice, fell in enormous quantities, beating down branches of trees, killing quantities of birds, &c. I am really speaking within bounds, when I say a goose's-egg was a trifle compared to some of the stones that fell. Only imagine the measurement of one, after being in a hot-house full ten minutes, in circumference *eleven inches and a-half*. I may safely aver, that if we had had a pit to deposit, with a hundred coolies to collect, we might have got sufficient ice in one hour after the storm to supply the whole station for the season. I have only heard of two men who lost their lives. I have just been informed that in the bazaar a man weighed one of the hail-stones, which was a seer (two-pounds); another man, three-quarters of a seer."—*India Gazette.*

HAILSTORMS ON THE NORTH WESTERN MOUNTAINS IN FEBRUARY, 1829.

Rainy, stormy, snow and hail, on the 2nd, 12th, 13th, 14th, 17th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, and 27th.

HAILSTORMS ON THE NORTH WESTERN MOUNTAINS IN MARCH, 1829.

Rainy, stormy, snow and hail, on the 1st, 2nd, 6th, 22nd, 23rd, 24th, 29th, 30th, and 31st.

HAILSTORM AT NAGPOOR ON THE 8TH APRIL, 1831.

The hail-storm on the 8th of April 1831, was referred at the time to the occurrence of an opposite current of dry winds, which appeared to impinge upon the sheet of rain presented to its influence, and the following description, taken from notes immediately afterwards, seems to confirm this idea. Neither the s mpiesometer or thermometer shewed any thing worthy of notice at this period. The hygrometer had through the 6th and 7th of the month ranged from 1.40 to 1.72, and during the 8th, it stood at 2.17 at 9 A. M., 2.12 at 2 P. M., and 2.22 at 8 P. M. Until past 2 P. M. the appearances on the sky had been cirrus from a distant nimbal cloud in the morning, cirro-cumulus, loose cirro-stratus, and some cumuli, passing below this, also of a loose structure. The wind had been blowing from the eastward in the morning, changing in the forenoon to the south-east, and continuing from thence afterwards; but towards 2 P. M. the course of the cumuli above shewed a current of air flowing there from the westward. Shortly after two, some distant thunder was heard, and the sky had become nearly covered with cirrus. Cumuli were observed to commence raining in the west, and they increased in size, and approached from that direction about 4 P. M. Another nimbus was seen in the south-east-ward, while that in the west was advancing, and loud gusts of wind with much dust began blowing from the former towards the latter. In the mean time, the western cloud kept approaching, the rain falling from it, presenting a whitish appearance above the dust, some scud was seen passing before it, in a course towards the east, and immediately a heavy fall of hail took place, driven by a wind from the west-ward. The hail continued to fall for several minutes, and the course of the cloud towards the east could be traced for at least four miles, by the damage done to the fruit trees, glazed windows, &c. in the cantonment. The breadth of the shower however was extremely small, the ground being found quite dry at a few hundred yards to the south-ward from where the hail, or rather the masses of ice, fell in greatest quantity. These masses were irregular, and clean on the outer surface; but in the centre presented a white crystallized appearance. Throughout the evening afterwards, several large cumulo-strati were seen in the east, with much lightning there; and a cool breeze blew from thence, with cumulus fragments of cloud on a clear sky. W. G.

HAILSTORM AT RANEEGUNGE ON THE 16TH MARCH, 1834.

Extract from a letter from Raneegunge (Alexander and Co.'s colliery), dated 17th March:—"My palkee-top yesterday was broke through in three places by hail-stones, some *four inches long*, and one of the bearers knocked down by them."—*Calcutta Courier.*

HAILSTORM AT PUBNA ON THE 12TH APRIL, 1834.

The following extraordinary statement is communicated to us by a respectable authority, who pledges himself for its truth, and who vouches that it can be attested by four European gentlemen who were present:—

"April 18, 1834.—A violent hail-storm occurred on the 12th instant, about half past five in the evening, in the neighbourhood of Pubna; one hail-stone was measured and found to be one foot in circumference; another weighed eleven ounces: no tile roof could resist these masses of ice:" —*Hurkaru.*

HAILSTORM NEAR BENARES IN FEBRUARY, 1836.

A private letter from the vicinity of Benares states, "we have had a tremendous hail-storm which has destroyed the grain almost entirely for twenty miles in length, and four in breadth. Some of the masses of ice were a seer in weight."—*Bengal Hurkaru.*

HAILSTORM AT SECUNDERABAD ON THE 30TH MARCH, 1837.

The *Thursday Budget* contains a letter from Secunderabad, giving an account of a tremendous hail-storm on the 30th March, in which some of the stones were two inches in diameter, "fully as large as middling-sized potatoes." The gardens are destroyed, immense arms of large trees cut completely across, the large door of the church shivered, and the place exhibiting the appearance of having suffered a cannonade.

HAILSTORM AT SEETAPORE ON THE 15TH MARCH, 1839.

A letter from Seetapore mentions, that on the evening of the 15th March there was a violent hail-storm, succeeded by heavy rain: the hailstones were uncommonly large, some five inches in circumference. Several birds were killed during the fall of hail, which lasted for more than a quarter of an hour.

HAILSTORM NEAR CALCUTTA ON THE 8TH APRIL, 1838.

Storm.—A storm of great severity took place on the 8th April, in the vicinity of Calcutta. The storm was so strong at Khootghuttah point, on the new canal, that the depots standing there were blown down, destroying about 250 labourers. The natives have been panic-struck. The labouring class say their last hope of at least a tolerable crop was destroyed by the shower of hail. The destruction of life and property on the salt-water Lakes, from the violence of the storm, was immense. At the salt-manufactory, belonging to Mr. Prinsep, at Ballinghaut, and for a distance of two miles round, nothing was to be seen after the storm, but ruins of dwellings scattered about, and wrecks of boats floating in every direction. Large boats of 5,000 maunds' burthen were either sunk or literally lifted out of the water on dry ground. Hailstones fell at Dum Dum of an unusual size. Two which were picked up measured each sixteen inches in circumference, and better than five inches in diameter. Another piece of an irregular form, measured full nine inches in length, and three inches in thickness.—*Hurkaru, April* 10.

HAILSTORM AT GRAHAM'S TOWN ON THE 11TH DECEMBER, 1839.

On the 11th December, Graham's Town was visited by a storm, attended by phenomena of very rare occurrence in this part of the colony. The day had been warm; about six o'clock, heavy masses of clouds began to spread themselves out, evidently much agitated by conflicting currents of air. The wind was in a similar perturbed state, whirling aloft in eddies the dust and every small particle of loose matter within its vortex. The lightning was extremely vivid; the rain was inconsiderable, but the hail was such as is not remembered by the oldest resident. It was a shower of large masses of ice, some of them eight inches in circumference, and a proportion of them half that size.

HAILSTORM AT JESSORE ON THE 5TH AND 6TH APRIL, 1840.

A heavy fall of rain and hail took place at Central Jessore, on the 5th and 6th April. The hail-stones are described as having been the size of walnuts; they killed a dog on the spot.

HAILSTORM AT MANDAVIE ON THE 24TH MARCH, 1840.

A hail-storm occurred at Mandavie, in Cutch, on the 24th March, which lasted half an hour, during which stones or masses of ice fell measuring seven inches in circumference, and weighing 2½ oz., each.

HAILSTORM AT BHOOJ IN APRIL, 1840.

Private letters from Bhooj state that showers of hail have lately fallen there, in which the hail-stones were as large as fowls' eggs, and some even the size of a turkey's. The natives, in spite of the danger of exposing themselves to the lightning which accompanied this storm, ran out and gathered large baskets full of this, to them, novel production.

HAILSTORM AT SUKKUR, UPPER SCINDE, ON THE 10TH MARCH, 1844.

Extract of a letter from Sukkur, dated 11th March:—"We have had beautiful weather lately, as the season was not quite so cold as the two last I have spent here; but last night about nine o'clock a most violent, indeed I may say terrific, shower of ice took place. Our common hail showers in Europe, even the worst of them, are but as a mist to such dreadful pelting; and as I had to go to an out office in it (I only made the attempt) was compelled to take shelter half way, with my hands over my head, being fairly beaten back with bruises innumerable on my arms and back from the blows of the globular balls of ice, from the size of a sparrow's up to that of a hen's egg. The noise and force resembled half spent discharges of grape from six pounders. It luckily happened that all the hail was almost completely round—had it been angular, serious injury would have been the consequence to many of the inhabitants. This storm lasted only 10 or 12 minutes, and the ice lay ankle deep about my place. When it ceased I got a pot of warm water, had a bath, a glass of brandy, went to bed, and rose as fresh as ever this morning, save the soreness. During the continuance of the shower I felt fully the truth of the old saying, 'Pelting of the pitiless storm.'"—*Bombay Gentleman's Gazette, March* 29, 1844.

HAILSTORM AT SATTARAH, ON THE 23RD SEPTEMBER, 1845.

A severe Hailstorm occurred at Sattara, during which above three inches of rain fell at the Residency in three quarters of an hour.

HAILSTORM AT LAHORE, ON THE 26TH MARCH, 1847.

On Friday last the 26th inst. we had a rattling storm: the hail-stones came down on us like marbles and billiard-balls, many of them measuring 1¼ inches in diameter. I found that four of them made a tolerable good mouth-full, larger in fact than I should like to have taken in the presence of a lady, but the sight of ice at Lahore was too tempting to be resisted, and so the frigid globules followed one after the other in rapid succession down my throat.—*Correspondent Delhi Gazette, April 7.*

HAILSTORM AT SIMLA, ON THE 27TH MARCH, 1847.

SIMLA, 28*th March*.—The G. G. arrived yesterday, ushered in by one of the heaviest storms of hail I ever witnessed; it had been hanging about for some time, making the weather unseasonably close and heavy—at first we got a deluge of rain, and a day or so after, the hail poured down in masses of ice amidst such thunder and lightning as alone can be heard and seen in mountains like the Himalaya.—*Mofussilite, April 2.*

HAILSTORM AT BELGAUM, ON THE 7TH APRIL, 1847.

On the 7th we had a heavy shower of rain, accompanied with thunder and lightning and a smart fall of hailstones; I have heard that two native girls have been severely injured by the electric fluid. Yesterday and to-day the weather has been threatening—the sky cloudy, with loud thunder: the heat is notwithstanding very great,—not a breath of wind to be felt.—*Correspondent Bombay Times, April 14.*

BELGAUM, 9th April.—The weather here has during the last week gradually been getting warmer, the thermometer ranging from 88° to 92° at 2 P. M., the afternoon being ushered in by strong squalls of wind from S. W. and N. E., with occasional clouds of dust and whirlwinds. These phenomena were usually followed by heavy clouds, thunder, and lightning, at nights. About four o'clock in the evening of the 7th the wind increased almost to a storm, accompanied by rattling peals of thunder, which were followed by a fall of hail and rain of an hour's duration. The thermometer before the storm stood at 90—at its conclusion it had dropped to 70°. Upwards of half an inch of rain fell. A native man and woman I hear were struck by the lightning near the Collector's Cutcherry, the injury they received proving fatal to them both on the spot. A thunder-bolt fell near the grenadier company's barracks of the Highlanders. The heat was much less yesterday than before the rain, but has again increased to-day. Distant thunder, threatening more rain, was heard during this morning; and whilst I write it is again pouring down in grand style.—*Correspondent Bombay Times, April 17.*

HAILSTORM AT BANCOORAH, ON THE 3RD APRIL, 1847.

A letter from Bancoorah, dated the 7th instant, says—"We have had one of the most severe hailstorms last Saturday evening I ever witnessed. Some of the pieces were from three to four inches in diameter. Cattle and human lives were destroyed."—*Calcutta Englishman, April 12.*

A TORNADO AND HAILSTORM AT POONA, ON THE 22ND MAY, 1847.

SIR,—On the 22nd instant, except a few light cirrus streaks the sky was clear, and all traces of the storm of the preceding evening had disappeared; but the air was still hot and oppressive to the feelings. At 3 P. M., a dense mass of heavy clouds rose in the South East and passed to North West, bearing from the cantonment about North East.

At 4.30 P. M. the sky being clear to the westward, another mass of cumulus clouds in the form of an arch had gathered in the east and was rapidly nearing us, enveloping the country beneath it in gloom, and pouring forth electricity almost without cessation, while the thunder reverberated along the heavens. Suddenly the ominous stillness of the atmosphere was broken by a violent gust from W. S. W. as if rushing to meet the coming tempest, the anterior edge of which was now overhead, at a great elevation, and hurrying on in a rapid scud to the westward. With the first movement of the air at the surface of the earth a heavy fall of rain, accompanied by numerous *hailstones*, took place and lasted for ten minutes. A short calm ensued; still the heavy masses of wild and broken clouds were coming up from the north east, and drifting overhead in the opposite direction. In ten or twelve minutes after the surface wind had exhausted itself in a south west squall, it re-commenced with great force at north, veering to north east, south east, and finally in twenty minutes or so returned to west south west, or nearly the quarter from whence it first began. During this time the rain descended in torrents, and hailstones of the largest size were so abundant that we could count six or eight on the surface of a square foot. By 5.45 P. M., the storm had ceased in a great measure, and the sky to the eastward was clearing up.

In the space of an hour, one inch and a half of rain fell. The most remarkable circumstance, however, was the quantity and size of the hailstones which descended along with the rain: many of them were of the size of a musquet ball or a pigeon's egg—those of the greatest magnitude fell about the middle of the tornado when the wind was blowing from north and north-east. Their shape was almost invariably oblong, and their structure that of concentric layers of congealed water. One was found to be an inch in diameter, and it must have

lost something of its original weight and bulk while sinking through the hot bed of air on the surface of the earth.

At the commencement of the storm, the thermometer was at 90° in the house, and 135° in the sun within a few inches of the ground. In half an hour it was down to 78° ; and when the whole was over it was as low as 72°. The dew point had been 74° in the morning : it rose to 78° by 4 P. M., and was reduced to 68° by the hailstorm.

By 6 P. M., the tempestuous mass of clouds had passed by, but still hung in majesty across the western half of the heavens, evolving lightning and sustaining one unceasing roll of thunder. At this time the upper stratum had the appearance of a funnel-shaped mass, from the lower and central part of which a dark pillar of cloud connected it with the earth and wrapped within its shade, the scene of stormy commotion that had just left us. The whole reminded us of those conical clouds giving rise to waterspouts that are so common near the equator in calms, but on so gigantic a scale that the lofty mountain of Singhur, upwards of 4000 feet in height, was too low even to have formed the base of the vast column reaching upwards to join the elevated body of cloud from whence the rain and hail were descending.

Nothing, however, could have been more grand and sublime than the wild and irregular masses of vapour floating about and partly hiding the summit of Singhur. It seemed as if a number of cloudy pillars bending from south-east to north-west were partially supporting a dense dark leaden coloured stratum at an immense height and the whole moving westward, while a low black snake-like looking cloud was seen winding itself round the base of the mountain from the westward, gradually ascending, and then turning back along with the 'upper drift.'

There is something very unusual in all this at such a season as this, and with the sun almost perpendicular at noon. Exactly one month ago we had a typhoon travelling with destroying force along the coast : now we have miniature typhoons and tornados almost every evening. Here there is an interesting field for enquiry in first causes, but one in which we dare not venture abroad at present : suffice it to glean a fact when it comes in our way.

Poonah, 24th May, 1847. C. M.

HAILSTORM AT UNJENEERE, NEAR NASSICK, ON THE 6TH APRIL, 1848.

6 A. M. Cloudy, with dense fog, southerly breeze.—9 A. M. a perfect calm.—3 P. M. Sky covered with heavy masses of cumuli, rain and lightning to west and north, wind variable.—6½ P. M. Strong breeze from S. E. This soon became a perfect Hurricane, and continued so a little more than half an hour, when it suddenly abated : it was accompanied with heavy rain, and some hail. Vivid flashes of lightning followed each other most rapidly, accompanied by loud crashing peals of thunder. This continued till about 3 A. M., when the breeze again freshened from S. E.—*Correspondent Bombay Times.*

HAILSTORM AT EDULABAD ON THE 16TH APRIL, 1848.

Bodwar, 4th May, 1848.—Having seen in your issue of the 12th ultimo, which only came to hand yesterday, an account of the storm of the 6th April, I thought that what occurred at Adjunta might be acceptable.—3½ P. M. very high wind accompanied by thunder, lightning, and very heavy rain ; wind E. N. E., which continued for near two hours, when it suddenly ceased. There was no hail here, but at a village six miles east of the ghaut a great quantity fell : the roads here were flooded. A similar storm took place on the 16th ultimo at Edulabad, 12 miles from Bodwar, at 4 P. M., and ceased at 7 P. M. Hail stones of ¾ inch in diameter fell, accompanied by heavy rain and thunder. The storm was so violent that the cattle carrying my baggage refused to face it, and could not be prevailed upon to proceed. The wind was, as before, E. N. E. and of tremendous force. I am not aware of the exact distance of Adjunta from Nassick, but I have reason to think that the rate the storm travelled was equal to its course from Nassick to Bombay.—*Bombay Times.*

HAILSTORM AT DEESA ON THE 14TH JANUARY, 1849.

At Deesa a violent thunder-storm occurred betwixt two and four o'clock on the afternoon of the 14th, with hail, and a heavy fall of rain. Here, as at most other places, it was followed by intensely cold clear weather : the wind during the storm was south-easterly.

HAILSTORM AT BELGAUM IN APRIL, 1849.

Belgaum, *24th April*, 1849.—The weather during this month has been, and still is, very trying ; large dense clouds are hanging about us threatening a thunder storm every evening, and yet it blows off after a current of high wind and dust, followed by thunder and most vivid lightning. We will get it very violently when it does come. Up to this date we have had 3 or 4 smart showers, and on one occasion large drops of hail—the total amount of rain is just one inch.

HAILSTORMS AT JAULNAH AND AURUNGABAD ON THE 14TH JANUARY, 1849.

A furious hail and thunderstorm, many people killed—hail the size of billiard-balls,—occurred at Jaulna on the 14th ; and on the same day one of less violence occurred at Aurungabad.

HAILSTORM AT RHOTAS IN THE PUNJAUB ON THE 22ND APRIL, 1849.

A thunder storm, with heavy rain, and hail of large size, occurred at Rhotas on the night of the 22nd.

HAILSTORM AT TIPPERAH ON THE 26TH MARCH, 1849.

We are in receipt of a letter from Tipperah, descriptive of a great storm stated to have occurred there on the 26th March, when no fewer than two hundred houses are said to have been blown down, while many trees of the growth of twenty or thirty years were rooted up and others of the same standing split to pieces. The North-Wester that caused all this damage is reported to have come on very suddenly, (as the sky was previously clear and the weather promising) and in the middle of the night. A good deal of hail fell on the occasion: indeed our correspondent says that on the other side of the river "Goomtee," the hailstones fell like rain and were gathered in heaps, while many birds were killed by them.—Bengal Hurkaru, April 5.

HAILSTORM AT PURNEAH ON THE 4TH APRIL, 1849.

A correspondent in the Purneah district informs us that on the 4th instant there was in his neighbourhood a fall of hail-stones as large as—orangos! The indigo crop was, he says, fearfully damaged by this heavy visitation, and no wonder; we suspect there must have been considerable destruction of other matters besides indigo plants if our friend has been guilty of no exaggeration.—*Hurkaru, April 11.*

HAILSTORM AT ANGERTOLLAH ON THE 14TH APRIL, 1849.

We are sorry to announce the death of Maha Raja Kistna Kissen Manick, Raja of Tipperah. This event happened at Angertollah on the 14th Inst. The Raja was killed by lightning during a severe Hail Storm. His sirdar bearer, who was with him at the time, was also killed, and two other servants severely injured. The storm was so violent that hardly a house is left standing in the neighbourhood.

HAILSTORM IN THE PUNJAUB ON THE 23RD FEBRUARY, 1849.

The orders to march were issued at an early hour on the 22nd of February, and the troops marched about 8 A. M., and kept up the pursuit for 14 miles, under a hot sun, and through a jungly country in the direction of the Khoree pass. During the night a heavy storm came on. The same storm appears to have ranged all along the outer range of the Himalayas, as it extended to Mussooree, and was felt here in the masses of dust that filled the air for two or three days after the 24th. On the 23rd, the march was resumed, and the force reached Khoree, the position which the Seikhs occupied in such force after having evacuated Russool. A hail-storm occurred as the troops were passing up the defile, and rain fell in torrents for some time after their arrival at Pooran.—Delhi Gazette.

HAILSTORM AT BHOOLOOA IN APRIL, 1849.

We learn from a correspondent at *Bhoolooa*, that cholera and fever are committing dreadful havoc at that station. He mentions, in particular, the instance of a family "which though it numbered, a few months ago, about *twenty* individuals, has now scarcely a soul left to perform the last offices on the last member thereof." He adds—"We had a dreadful storm here the other day. It killed upwards of twenty people, cleanly sweeping off the leg of one, the arm of another, and so on. We had also a hailstorm. My compound appeared as if it were covered with a sheet of ice, a foot thick. The oldest inhabitant of this part of Bengal does not remember to have seen the like.

HAILSTORMS AT SIMLA AND KURNAUL ON THE 3ND MAY, 1849.

DELHI.—On the day on which such stormy weather occurred here (Thursday the 3d inst.) it appears that a severe hail-storm took place at Simlah, which did great damage to the gardens there. At Kurnal, a similar, but still heavier, fall of hail cleared the trees of all the promise of fruit they bore. (From subsequent letters we learn that the stormy weather continued for three days at Simlah, and on one occasion the fall of hail was so great as to cover the ground for several inches.)—Gazette.

HAILSTORMS AT PESHAWUR ON THE 1ST, 2ND, 3RD, AND 4TH, MAY, 1849.

PESHAWUR.—Rain had fallen there without almost any intermission from the night of the 30th of April to the night of the 2nd May. On the morning of the 3rd it was clearing up. Heavy rain, with thunder, lightning, and hail, for the first four days in the month. Winds generally Westerly, and S. W. Severe dust-storms occasionally.

HAILSTORMS AT DACCA IN MAY, 1949.

The following is an extract of a letter from Dacca, dated the 7th instant:—"We have had fearful hail-storms of late, which have done great harm to the plants; the rivers have risen much of late, and the manufacturing has consequently commenced."—Englishman, May 12.

HAILSTORM AT BELGAUM ON THE 2ND JUNE, 1849.

BELGAUM, *9th June*, 1849.—On the evening of the 2nd instant we were visited by one of the severest storms of wind and rain that was ever experienced at this station. It commenced with a little mizzling rain at 4 P. M., but the storm did not occur till after 5, and continued one down-pour till half-past 8 o'clock. For more than 20 minutes of this period the fall of hail-

stones was awful, being the largest I had ever seen; they were not spherical or oval, but appeared irregular shaped, as if a vast number of smaller ones had united in their descent from the clouds. The thunder was deafening, and the lightning very vivid and frequent. This hurricane has caused a general ruin of the plantain groves, and smaller fruit trees, in all the gardens both in town and country, as well as in the fort. The fall of rain I hear was registered in the Highlanders' hospital at five, and little more than two inches in the fort. Scarcely a house escaped without having a few of the tiles carried away. Several lives were lost in the neighbourhood of the town of Shalpoor, and I have been informed the fine wooden bridge over the deep and wide nullah leading to it was carried over, but not swept away. Major Hamilton, of the Highlanders, who was out riding in the evening, had a narrow escape from a watery grave, but owing to the instinct of his horse, he escaped being immersed in a deep pool, which was not noticeable from the country being overflooded by the rain. Since the 2nd the weather has put on its monsoon aspect, a strong S. W., chilly, damp wind blowing day and night, with small searching rain. Several people who have arrived from Kolapoor and Poona within the past day or two state that the nullahs and rivers are all overflowed, making travelling far from agreeable.

HAILSTORMS AT INDORE ON THE 6TH AND 7TH JUNE, 1849.

We have letters from Malwa of the 14th instant, containing an account of a couple of Hail-storms which had occurred at Indore on the 6th and 7th. That of the latter date is said to have been a most furious one, preceded by a violent wind from the N. E. They had come on, as the early rains usually do, with thunder and lightning, about four o'clock in the afternoon, and passed off to the N. W. Some of the hailstones had been weighed, and were found to average eighteen grains—they were about the size of small grapes. The storms had had but little effect on the temperature, the thermometer having fallen but 4°. From the 7th to the 14th only one slight shower of rain had occurred: the wind was however southerly, and the sun scarcely ever visible through the clouds, so that a heavy fall was speedily looked for.—Bombay Times, June 20.

HAILSTORM AT SHUNKERGHUR, NEAR PESHAWUR, ON THE 22ND SEPT., 1849.

From Captain H. JACOB, Commanding Detachment 19th Regiment N. I., to A. MALET, Esq., Chief Secretary to Government, Bombay.

Political Department.—Dated 13th October, 1849.

SIR,—Observing by the report of the proceedings of the Bombay Geographical Society, that Government are desirous of obtaining notices of thunder, hail, and dust-storms, &c., it has occurred to me that an account of a hailstorm which lately happened here, may be interesting, the hailstones being larger than I have ever before seen.

2nd. The morning of the 22nd September last was fine, till towards 8 o'clock, when dark clouds gathered very quickly on the range of hills to the North West, distant about 6 or 7 miles, and shortly after 9 the storm burst over the Fort, lasting with slight intervals for about 20 minutes. The hail stones were from the size of musket balls to that of bantams' eggs. I measured one, which was full an inch and a half in diameter: no rain followed the hail. It was afterwards reported to me that two men had been killed in the fields by the hail, but I have since heard that they recovered.—I have the honor to be, &c.

(Signed) H. JACOB, Captain, Commanding Detachment 19th Regiment N. I.

Fort Shunkerghur, about 16 miles nearly North of Peshawur, 13th October, 1849.

(True Copy) A. MALET, Chief Secretary.

HAILSTORM OF 24TH NOVEMBER, 1849, AT INDORE.

INDORE, 8TH DECEMBER.—We had a most violent storm of wind and hail on the 24th ultimo, from E. and N. E.: the hailstones were very large, and the quantity of rain which fell was sixty cents. Since then we have had uninterrupted cold weather, the thermometer yesterday at 6 A. M. being 34° and ice upon the ground. The hailstorm extended over a large tract, for it raged at Sohore, ninety miles to the eastward of us, on the same day, and at Mhow, fourteen miles to the westward: it was travelling south. The palace was struck by lightning, and three men injured, and we were apprehensive that more mischief would be done, the electric fluid was so close.—*Bombay Times.*

A correspondent at Broach sends us the following:—"There is a great deal in your paper of the 8th instant under the head of the 'Geographical Society,' about Dr Buist and Hail Stones. It may perhaps be interesting to that learned individual to know that there was only a hail storm at Indore, on the 24th ultimo, but a very heavy one occurred on the same day within a few miles South of this; and as you appear to have no 'Fat Contributor' from this benighted locality, allow me to describe it. The morning had been oppressively hot and cloudy: as the day advanced, a storm appeared brewing to the South West. About 2 o'clock the wind blew with great force from that quarter, accompanied with clouds of dust and a very marked decrease in the temperature: in fact, it was almost cold, *rain* was to all appearance falling fast and thick in the distance. In half an hour, the storm gradually subsided, the clouds taking an Eastward direction towards the Raj Peepla Hills, where they appeared again together. Reports were soon

received that a violent hail storm had taken place at the village of Oomorwarra. Whole fields of cotton and jowaree &c. were destroyed; the stalks had been literally cut asunder by the hail stones. The more intelligent of the natives describe the stones as having been as large as good sized hens' eggs, although others give such a stretch to their imagination as to describe them as little less than their own cocoanuts. I have heard of no injury done to cattle."—*Telegraph*.

HAILSTORM OF 1st DECEMBER 1849, AT DELHI.

On Saturday last we experienced a very heavy fall of rain, accompanied with thunder and lightning, the latter most vivid, and since that day the weather has been very cold, the mornings and evenings bitterly so. We have heard that heavy rain has also fallen in the district accompanied by hail; it commenced on Thursday afternoon, continued during the whole night, and on Friday forenoon poured down in grand style. The Mohurrum passed over peaceably.—Delhi Gazette, December 5.

HAILSTORM AT BANDA ON THE 4TH JANUARY, 1850.

Banda, *5th January*, 1850.—Yesterday our station was treated with one of the most severe hailstorms I believe almost ever experienced; it commenced about a quarter before 11 P. M., and pelted without cessation for about a quarter of an hour; the ground round about the house was covered with ice, and looked like frozen snow, about 1½ or 2 inches thick, the hail stones being as large as pigeons' eggs, and some of them even larger. The natives stared with astonishment, and the "oldest inhabitant" declared he had never gazed upon the like before: the damage to the opium crops must be considerable. The weather had been very murky and cloudy for some time; it is now fine and clear again, although the early part of the morning was very foggy.

HAILSTORM AT GWALIOR ON THE 5TH FEBRUARY, 1850.

We have not seen any mention in the Mofussil papers of a violent hailstorm at Gwalior, which took place on the 5th of February. A correspondent informs us that pieces of ice fell nearly a seer in weight, and that many animals and some men were killed.

HAILSTORM AT SATTARA ON THE 7TH APRIL, 1850.

Sattara, 9th April.—As I believe you are interested regarding storms &c., I just write these few lines to inform you that on Sunday last, between the hours of four and five o'clock, a tremendous fall of hail occurred at a village called Condwul, about six miles from Sattara. The hailstones are described as being as large as cocoanuts: several houses fell, cattle were slain, and several people were killed by the houses falling in. Many large fish were killed in the river also. The natives declare they have never seen such hail in their lives. I am within the mark when I say they were as large as cocoanuts: they have been described as much larger. In camp we had merely a tremendous dust-storm, but for several hours the sides of the hill were white with the hail, like snow in appearance.—*Bombay Times*.

HAILSTORM AT OOTRAG ON THE 22ND APRIL, 1850.

A shower of hail fell at the village of Ootrag, not far from the Rajpeepla Range. It was cloudy at Broach, with the appearance of rain in the northwest.

HAILSTORM AT RAJKOTE ON THE 28TH MAY, 1850.

Rajkote, *12th July*.—How was it that you did not record the storm which occurred here on the 28th of May, which was most violent, tearing up trees, knocking over sentry boxes, &c.: it was accompanied by a very heavy fall of hail and a violent wind. It blew down the stables of one of the Officers of the 2nd Cavalry—killing one of his chargers. The Camp seems to have been the centre of the Cyclone, and the effects of the storm seem to have been confined to it and a circle of two or three coss round. We have had but a shower or two, and the sky is cloudless.—*Telegraph, July* 19.

MISCELLANEOUS NOTES OF HAIL-STORMS. BY DR. SPILSBURY.

Year.	Date.	Place.	Time.	Remarks.
1817	April 3	Cawnpore.	8 P. M.	Storm of hail, rain, thunder & lightning.
1819	July 17	Nursingpoor.	Sunset.	Violent storm of hail, rain, thunder, and lightning. Hail, masses of ice, very irregular, killing goats and sheep. By the lightning a bungalow burnt, and some twenty people killed about the station.

MISCELLANEOUS NOTES OF HAIL-STORMS. BY DR. SPILSBURY.

Year.	Date.	Place.	Time.	Remarks.
1821	Jany. 24	Jubbulpoor.	4 P. M.	Storm hail, rain, thunder & lightning.
1823	Feb. 23	Jubbulpoor.	Sunset.	Storm hail, rain, thunder and lightning. Hail-stones not large.
1824	Feb. 3	Near Jubbulpoor.	Sunset.	Storm hail, rain, thunder, and lightning.
1824	Feb. 7	Nursingpoor.	3 P. M.	Storm hail, rain, thunder, and lightning.
1825	Feb. 10	Jubbulpoor.	11 P. M.	Storm hail, rain, thunder, and lightning.
1827	Dec. 24	Jubbulpoor.	11 P. M.	Storm hail, rain, thunder and lightning.
1828	Mar. 6	Neempanee near Beitool.	3 P. M.	Storm hail, rain, thunder, and lightning.
1829	Feb. 13	Antara near Gwalior.	4 P. M.	Storm hail, rain, thunder and lightning. Hail not large.
1829	Mar. 2	Agra.	8 A. M.	Storm hail, rain, thunder and lightning.
1830	Mar. 18	Saugor.	Noon.	Storm hail, rain, thunder and lightning.
1831	Feb. 12	Jubbulpoor.	11 A. M.	Storm hail, rain, thunder and lightning.
1831	April 9	Jubbulpoor.	4 P. M.	This was the most violent hail-storm I ever witnessed. It extended about six miles in width, lasted one hour; hail many as big as fowls' eggs: on clearing up, the hills about were quite white. Hackerie loads of ice were brought in five days after, and dry wells filled up, which lasted to the rains.
1832	Feb. 8	Saugor.	Sunset.	Storm hail, rain, thunder, and lightning.
1836	April 2	Jubbulpoor.	2 to 3 P.M.	Storm hail, rain, thunder, and lightning.
1837	Mar. 9	To N. W. of Jubbulpoor.	4 P. M.	Storm hail, rain, thunder, and lightning.
1838	Feb. 15	Khirkhurree.*	Sunset.	Storm hail, rain, thunder and lightning. *These two marches are near Munsta on the Nerbudda.
1838	Feb. 16	Jhiria.*	Midnight.	Storm hail, rain, thunder and lightning, but much severer than preceding day.
1838	Mar. 14	Umurkuntuc.	Noon.	Storm hail, rain, thunder and lightning.
1839	Mar. 15	Umurkuntuc.	4 P. M.	Storm hail, rain, thunder and lightning, but slight hail.
1839	May 30	Jubbulpoor.	2 P. M.	Storm hail, rain, thunder, and lightning. No hail in the cantonment, heavy in the town.
1840	Jan. 25	Saugor.	6 P. M.	Storm.—In this storm a sepoy was struck by lightning, and the rupees in his purse about his hips fused,—some of them run into each other.
1840	Feb. 9	Putharees, 28 miles E. of Saugor.	9 A. M.	Storm hail, rain, thunder and lightning.
1840	April 22	Jubbulpoor.	5 P. M.	Storm hail, rain, thunder and lightning.
1841	April 13	Jubbulpoor.	3 P. M.	Storm hail, rain, thunder and lightning.
1845	Feb. 22	Brumhar Ghat, 15 miles N. W. from Nursingpoor.	Afternoon.	A severe hailstorm to the northward of this Ghaut on the Nerbudda. I was at Nursingpoor on that day, but as my way lay through those villages, I had an opportunity of seeing the devastation to the crops,—they were literally mowed down for three miles.
1846	Feb. 12	Bhilturra near Dumoh.	4 P. M.	Storm hail, rain, thunder and lightning.
1847	Feb. 13	Maharajpoor near Deeoree, 36 miles S. of Saugor.	4 P. M.	Storm hail, rain, thunder and lightning.
1849	Nov. 24	At Dumoh.	2 P. M.	Very severe storm of hail, &c., doing much damage to buildings. The tiles of whole ranges smashed, and trees blown down. This is the only instance I have known of hail in November.

ART. XIII.—*Notices of the most remarkable Meteors in India of the fall of which accounts have been published.* By G. BUIST, LL.D., F. R. S. L. and E., &c.

PROFESSOR BADEN POWELL having been for some time engaged preparing lists for the British Association, of the most Remarkable Meteors of which accounts could be obtained, intimated in 1848 his anxiety to receive descriptions of Meteors wherever they might have been observed. It was obvious from the lists laid before the British Association in 1847, and 1848, that Professor POWELL was very imperfectly acquainted with the accounts which had within the last thirty years been given of many most remarkable meteors that had fallen in India,—and that if these were collected, and notices of such as might be from time to time observed extracted from the newspapers, a very considerable amount of assistance might be rendered him. I found as I proceeded, that by causing notices of meteors to be inserted in the *Bombay Times*, gentlemen were induced to write accounts of such as they had seen, who otherwise might have remained silent ; and the multitudes described during the two past years compared to the small number of notices we have anteriorly to this, sufficiently indicate the conveniency of the practice, and its adaptation for eliciting intelligence. I hope to be able to go on with the system now commenced. India is peculiarly suited for investigations of this description, and the anxiety our Governments have lately exhibited to collect information, ought to furnish incentives enough to collectors to observe and record whatever is to be seen worthy of notice. I intended to have accompanied the list with an analysis of its contents : this I find myself compelled to postpone for the present. At the conclusion, some extracts, printed for the use of the general reader, will be found, on the subject of meteors as observed in other parts of the world.

METEOR OF 14TH ———, OBSERVED AT MALACCA.

AN uncommon phenomenon appeared on the evening of the 14th, between seven and eight o'clock, which has produced a curious sensation amongst the inhabitants of this settlement. A meteoric globe of fire, of about the size of the full moon, when seen in the horizon, approached from the south-east, and passed over the town in a north-west direction, at a height not much above the tallest trees. It was followed by a rattling broken noise, somewhat resembling that of thunder, produced, we suppose, by the bursting of the ball, which took place at some distance from the town. The oldest people in Malacca say they never witnessed such a thing before, and many, not knowing its real nature, consider it a portentous omen for evil. Some very sagely prophesy that there will be war; others that rice will be dearer ; and others again aver that the world will soon be at end. The Malays say that it is an *Antoo Api*, or Fire Spirit, sent to destroy some wicked man's house ; and others that it is the serpent of the sun which has got loose and is going its peregrinations. We understand that a China-man, who had been sickly for some time previously, was so terrified by the appearance, that he sunk down in a fit and instantly expired.—*Malacca Obs., May* 20.

METEORIC STONE WHICH FELL ON THE 18TH FEB. 1815.—PRESENTED TO THE COMPANY'S MUSEUM.

THE following is an authentic account of a meteoric stone which was lately brought from India by Lieutenant Colonel Pennington, and presented to the Hon'ble East India Company, who have deposited it in their museum.

Extract of a letter from Captain G. Bird, 1st Assistant in the Political Department, to Major General Sir D. Ochterlony, Bart., K. G., C. B., to Major Pennington.

Loodianah, 5th April, 1815.—My dear Major, I lost no time, after my receipt of your letter, to take the measures for obtaining the information you desire relative to the meteorolite, which lately fell near the village of Dooralla. Accounts of this extraordinary phenomenon had spread over the whole of the Seikh country; and for more than a month before your letter reached me, the account of its *fall*, connected with a great number of wonders, had been reported to me, and that the people from all the neighbouring villages had assembled at Dooralla to pay their devotions to it, but, now, after a very full enquiry, I feel quite satisfied that you may rest confident in the accuracy of the following statement. On the 18th February last, about noon, some people who were at work in a field about half a mile distant from the village of Dooralla, were suddenly alarmed by the explosion of what they conceived to be a large cannon, "the report being louder than that of any other gun* they had ever heard," which report was succeeded by a rushing noise, like that of a cannon ball in its greatest force. When looking towards the quarter whence the noise proceeded, they perceived a large black body in the air, apparently moving directly towards them, but passing with inconceivable velocity, buried itself in the earth, at the distance of about sixty paces from the spot where they stood. As soon as they could recover from the terror with which this terrific vision had appalled them, they ran towards the village, where they found the people no less terrified than themselves, though not having seen the stone, imagined that a marauding party was approaching, and as but too frequently happens, would sack their village. When the Brahmins of the village were told what had really happened, they determined to proceed, and were followed by all the people, to the spot where the stone fell, having with them instruments for digging it out. On their arrival at the place, they found the surface broken and the fresh earth and sand thrown about to a considerable distance, and at the depth of rather more than five feet, in a soil of mingled sand and loam, they found the stone, which they cannot doubt was what actually fell, being altogether unlike any thing known in that part of the country. The Brahmins taking immediate charge of the stone, conveyed it to the village, where they commenced a Pooja, and covering it with wreaths of flowers, set on foot a subscription for the purpose of erecting a small temple over it, not doubting from the respect paid to it by the Hindoos, to turn it to a profitable account. As I said before, it fell on the 18th of February about midday, in a field near the village of Dooralla, which lies about lat. 30°23', 76° 41' long., within the territory belonging to the Pattialah Rajah, sixteen or seventeen miles from Umballah and, eighty from Loodianah. The day was very clear and serene, and as usual at that season of the year, not a cloud was to be seen; nor was there in the temperature of the air, any thing to engage their attention; the thermometer of course may be stated at about 68° in the shade. The report was heard in all the circumjacent towns and villages, to the distance of 20 coss, or 25 miles, from Dooralla. The Pattialah Rajah's Vakeel, being in attendance here, when your letter reached me, I desired him to express my wish to the Rajah, to have this stone; and as it appears that he had been led to consider it rather as a messenger of ill omen, he gave immediate orders for its conveyance to Loodianah, but with positive injunctions, that it should not approach Pattialah, his place of residence. It arrived here yesterday, escorted by a party of Brahmins and some Seikh Horse. It weighs rather more than 25 pounds, and is covered with a pellicle, thinner than a wafer, of a black sulphureous crust; though it emits no smell of sulphur, that I can discover; but, having been wreathed with flowers while in possession of the Brahmins, the odour originally omitted, may by these be concealed. It is an ill shapen triangle, and from one of the corners a piece has been broken off, either in its fall, or by the instruments when taking it out of the ground. This fracture discloses a view of the interior, in which iron pyrites and nickel are distinctly visible. Since its arrival all the Brahmins in the neighbourhood have assembled at my tents to pay their adoration to it; and no Hindoo ventures to approach but with closed hands in apparent devotion, so awful a matter is it in their eyes. I shall avail myself of the first escort that leaves Loodianah, to forward it to you.—*Original Communication.*

METEORIC STONE WHICH FELL NEAR AGRA ON 7TH AUGUST, 1822.

At a late meeting of the Royal Institution of Great Britain a large meteoric stone was placed on the library table, with a particular account of its fall, in the Persian language. This was translated by Dr. Wilkins. The stone fell in the night of the 7th of August 1822, near the village of Kadonah, in the district of Agra. It descended with much noise as of cannon and of the wind, awakening those who were asleep, and alarming a watchman who heard it fall. On making a search in the morning, the stone was found warm, and with a little smoke rising from it.

METEOR OF MAY 1823, OBSERVED AT ASSEERGHUR.

A very large meteor was seen at Asseerghur in May 1823, followed by a shower of stones.

METEOR OF NOVEMBER 1824, OBSERVED BETWEEN CAWNPORE AND BHURTPORE.

A meteor was seen from between Cawnpore and Bhurtpore, rising in the north, in November 1824. It was visible for about twenty-five minutes, when it gradually melted away.

* The supposed and the actual circumstances are in this expression oddly involved: we consider that the natives employed this language, and that the author of the letter gives their literal words.—*Edit.*

METEOR OF 3RD NOVEMBER 1825, OBSERVED AT CALCUTTA.

Colonel Blacker's third communication gives an account of a singular meteor, having the appearance of an elongated ball of fire, which he observed on the 3rd of November, a little after sunset, when on the road between the Custom-house and the Court-hall. Its color was pale, for the daylight was still strong, and its larger diameter appeared greater, and its smaller less, than the semi-diameter of the moon. Its direction was from east to west, its track nearly horizontal, and altitude about thirty degrees. Colonel B. regrets not having heard of any other observation of this phenomenon at a greater distance, whereby he might have estimated its absolute height. As, however, it did not apparently move with the velocity of ordinary meteors, it was probably at a great distance, and consequently of great size. So long as Colonel Blacker beheld it, which was for five or six seconds, its motion was steady, its light equable, and its size and figure permanent. It latterly, however, left a train of sparks, soon after which it disappeared suddenly, without the attendant circumstance of any report audible in Colonel Blacker's situation. Colonel Blacker concludes his paper with some interesting observations on luminous meteors, and considers them of perpetual occurrence, although daylight, clouds, and misty weather, so often exclude them from our view. Of their number no conception can be formed by the unassisted eye, but some conjecture may be formed of their extent from the fact mentioned by our author, that in using his astronomical telescope he has often seen what are called falling stars, shooting through the field of view, when they were not visible to the naked eye ; and when it is considered that the glass only embraced one-twenty-five thousandth part of the celestial hemisphere, it will be apparent that these phenomena must be infinitely numerous, in order to occur so frequently in so small a space —*Calcutta Government Gazette.*

METEOR OF 2ND DECEMBER, 1825, OBSERVED AT CALCUTTA.

A remarkable meteor was visible on Friday night S. W. of the comet, and near it. It appeared in shape at first like a ball of fire, which assumed the form of a vividly brilliant comet. This continued beautifully and powerfully luminous for some minutes, but gradually waxed fainter and fainter, until at length it totally disappeared.—*India Gazette, Dec.* 5.

FALL OF AN AEROLITE IN THE DISTRICT OF CUDDAPAH, ON THE 2ND JANUARY 1831.

Notice of the Fall of an Aerolite. By J. Malcolmson, *Madras Medical Establishment.*

On the 2nd of last January, at 3 A. M., the inhabitants of the village of Mangapatnam, in the Taluk of Jamalmadagu, in the Cadapah district, Lat. 14° 43′ north, Long. 78° 19′ east, were alarmed by four successive loud reports as of a gun, passing from north to south, and by the appearance of a bright light, as if robbers had lighted torches previous to an attack on the village, and compared by the inhabitants to 'day,' or the 'fall of a great star.' The villagers immediately ran out and saw a large ball fall on the bank of a nullah, south of the village. It had sunk in the ground and was broken to pieces, some of which were sent to the collector. It appears to have been more than half a foot in diameter; the external surface is black, round and polished, but this coating is very thin : within, it is of a light grey color, granulated and glistening with metallic particles. A specimen was examined by an able chemist, Mr Bannister, of the Mint at Madras, and found to contain nickel and the other usual ingredients. It deserves to be mentioned, that when first examined, the stone easily crumbled down in the fingers, but became hard on exposure. This and the phenomena attending the fall, seem to confirm the theory of the formation of these stones in the atmosphere.

A small specimen will be forwarded to you by H. Lacon, Esq., the Collector, to be presented to the Asiatic Society.

Note.—We trust that our correspondent will favor us with the promised specimen, that it may be compared with four other Indian aerolites now in our possession.—Ed.—*Gleanings in Science,* vol. iii., p. 389.

METEORS OF 23RD JUNE, AND 24TH JULY, 1832, OBSERVED AT DELHI AND MEERUT.

Delhi, 28th July, 1832.—An extraordinary large meteor, or rather three balls of fire, at first arose out of the E. S. E horizon on the 23d of last month, and, after rising to the elevation of about fifteen degrees, joined into one, forming a large ball of brilliant fire, nearly as big as a full moon in the meridian, and passed over an arc of the heavens of about 115 degrees before it vanished in the W. N. W. The light was very brilliant. This took place about ten o'clock at night, and I suppose but few persons witnessed it. Another, almost equally big, passed over Meerut a few nights ago, and disappeared with a brilliant and dazzling light in the W.N.W.—N. B. The first meteor passed over the city of Delhi, and its greatest altitude was about seventy degrees. It passed to the north of the Juma Musjid.—*India Gaz.*

METEORS OF 13TH NOVEMBER 1832, OBSERVED AT BULRAMPORE AND AGRA.

The *India Gazette* contains extracts from two letters, one from Bulrampore, in the Jungle Mehauls, the other from Agra, communicating accounts of a very remarkable atmospherical phenomenon.

"*Camp Bulrampore,* 13th Nov.—During our march this morning, the sky presented a most brilliant spectacle. Innumerable meteors were flying in every direction, and some of them the most beautiful I ever saw. They appeared to burst finer than the finest sky-rockets, leaving a long line of various-coloured light in the heavens behind them, which remained several minutes, and vanished gradually. I never saw any thing like it before, and I should think it not a common thing

in India; for I have travelled frequently at different hours of the night, and never before witnessed a similar phenomenon."

"*Agra, 18th Nov.*—Some nights ago, there was a most extraordinary appearance in the heavens. The sky was all one blaze, owing to the number of falling stars."

The same phenomenon was seen, at the same time, at the three presidencies.

METEOR OF 18TH MARCH, 1833, OBSERVED AT MADRAS.

On the evening of the 18th inst. at *5h. 27m.* mean time, a meteor of great brilliancy and magnitude made its appearance towards the N. E., in the constellation *Cor Caroli*, from whence, pursuing a northwesterly direction for ab out 3°, through the constellation *Hercules*, it disappeared at an altitude of 35°. The time it remained visible did not exceed two or three seconds. Listening attentively, at about 6½ minutes after the disappearance, a report was distinctly heard, which very evidently proceeded from the bursting of the meteor; the distance resulting from this interval is in round numbers about eighty-one miles.

Madras Observatory, 20th March, 1833. T. G. TAYLOR, H. C.'s Astronomer.

METEOR OF 11TH JANUARY 1837, OBSERVED AT SEHORE.

At Barsia, near Sehore, 1837, January 11.—At *6* P. M. a meteor appeared near *β* Andromedæ, and not far from the zenith: it went down to the westward, occupying two or three seconds in its flight, and inclining a little to the left. At about 30° of altitude it burst into a globe of light little inferior to the Sun in size and brightness, and then disappeared, leaving behind a long train of smoke, which continued visible for many minutes like a thin cloud enlightened by the Sun's rays. At about 6h. 5m. a faint rumbling sound was heard, like the discharge of artillery. The appearance was nearly the same at Sehore, though distant thirty-six miles S. S. W."—Extract of a letter dated Sehore, 17th Jan. 1837. *Bengal Asiatic Transactions*, Vol. VI., p. 19.

METEOR OF 6TH MARCH 1839, OBSERVED AT MADRAS.

On the evening of the 6th March 1839, a meteor passed over Madras of the size and brilliancy of the full moon.

METEORIC STONE WHICH FELL AT THE CAPE ON THE 13TH OCTOBER, 1838.

An account of the Fall of a Meteoric Stone in the Cold Bokkeveld, Cape of Good Hope. By THOMAS MACLEAR, *Esq., F. R. S. &c., in a Letter to Sir* JOHN F. W. HERSCHEL, *Bart., V. P. R. S. &c. &c. Communicated by Sir* J. F. W. HERSCHEL.

Received March 7,—Read March 21, 1839.

DEAR SIR JOHN, Royal Observatory, Cape of Good Hope, November 24, 1838.

A meteor exploded on the 13th of October in the Cold Bokkeveld, with a noise so loud as to be heard over an area of more than seventy miles in diameter, in broad daylight, about half-past nine in the morning. It was seen traversing the atmosphere north-east of the point where it exploded sixty miles, of a silvery hue, the air at the time calm, hot and sultry. The barometer chanced to be observed at Worcester, where the air was also calm and hot. It stood at the lowest point of its range, but, from the construction of the instrument, that point cannot be noted in inches unless by comparison with another, which I will endeavour to have done the first opportunity.

The explosion was accompanied by a noise like that from artillery, followed by the fall of pieces of matter, of which I send you the largest and best specimen I have seen, procured by Mr Watermeyer. Portions fell or were dispersed on the ground at the distance of an hour, or five miles from each other. Some falling on hard ground were smashed; others on moist ground plunged into the earth; and I am told that one piece made a hole as broad as three feet, and sunk deep. It is stated to have been so soft as to admit of being cut with a knife where it first fell; then it hardened, but I cannot learn anything as to its temperature at that moment. If the reports are correct, I estimate the original solid mass at five cubic feet, viz. the sum of all the portions that fell to the ground.

That which I send to you is a good specimen, for the fracture is exactly similar to those I have seen that fell elsewhere, but, from being broken into small pieces, few of them have any crust or outside to show the state of fusion. This exhibits that state all over: when the two pieces are applied to each *other* they exactly fit, and show that *it* was in a state of ignition when it separated from the rest in the air.

Mr Judge MENZIES told me he was returning from circuit accompanied by Mr GEORGE THOMSON. On the morning of the 13th "he was in the bush," about sixty miles from the Bokkeveld, on his way homewards. The air was hot and calm, as preceding a thunder storm, but the clouds were not dark; on the contrary, they had an unusual reddish tint. About half-past nine his attention was roused by something like a meteor, of a silvery colour, passing through the atmosphere, to which he directed the attention of those about him. The object moved in the direction of the Bokkeveld. He proceeded on his journey, and arrived in the evening at the place of Mr DE TOIT, where he was told that a meteor had exploded in the morning, with a report as loud as "from three pieces of cannon," and that some of it fell close to the place, one nearly striking a person in a field.

Mr TRUTER, Civil Commissioner of Worcester, was sitting in his office. He told me that the windows suddenly shook; immediately a rumbling noise followed, which he supposed was the precursor of an earthquake; his barometer stood at the lowest point of its range. Mrs. TRUTER heard a similar noise in the dwelling-house; other persons in the town were startled by the

like noise; the next day he heard of the meteor in the Bokkeveld. The statement made to him by several persons is so like the statement in the enclosed letter of Mr WATERMEYER's correspondent, that it is unnecessary to repeat it.

Understanding that Mr WATERMEYER had obtained a portion of the meteorolite, of considerable dimensions, I wrote to him to request a piece for you. He returned the enclosed reply, together with the whole specimen, wherein you will find that he had designed it for you. The clergyman's communication is clear and comprehensive.

On reference to the Observatory Meteorological Journal, there is nothing remarkable noted.

h	Barom.	Out. Ther.	Wet.	Wind.	
Oct. 12. 9½	30·191	60·1	58·5	4 S.	8 blue.
20¾	·247	64·2	62·5	3¾	6 b. cirri. Direction horiz.
13. Noon	·242	74·2	67·0	3 SSW.	5 blue cirri.
3½	·230	74·2	68·7	4 SSW.	6 blue cirri.

Therefore the effect did not extend so far.

You will find the Cold Bokkeveld on the map by carrying your finger along the parallel of St. Helena Bay.—Believe me, dear SIR JOHN, your faithful servant,

THOMAS MACLEAR.

Translated Extract from a Letter of the Rev. Mr. FAHN *to Mr* WATERMEYER, *dated Tulbagh, 6th November,* 1838.

The object of these lines is to fulfil my promise in sending to you herewith one of the stones which fell simultaneously during the atmospheric tremor in the Cold Bokkeveld, on the 13th of October. This stone was found between the estates of JACOBUS JOOSTEN and PIETER DE TOIT. Several have fallen on the place of RUDOLPH VAN HEERDEN, where one fell on the hard road, and was dashed to pieces. Another on a ploughed field sunk a few inches into the ground, and a third falling on a moist place near water, lodged itself to the depth of several feet. Some people say they observed smoke whilst these stones fell; and also that when they were picked up a smell was observable, as between sulphur and gunpowder.

The stone which you receive lay one hour distance from the place where the others were found. In the *same* direction in which the agitation was perceptible, viz. from N.W. to S. E., more stones were found. Some people saw in the same direction also a dark blue streak, which lost itself in a south-easterly direction. I have another somewhat larger stone in the Bokkeveld, which was too heavy for me to carry on horseback. If the latter one can be of service to you, I shall not fail to send it. This stone was found in *two* pieces, as it is at present.

Mr WATERMEYER's *Letter to* THOMAS MACLEAR, *Esq.*

MY DEAR SIR, Wednesday Morning, 21st November, 1838.

I have to thank you for the favour of your note of Saturday last by Doctor KRASS.

As soon as I received the accompanying specimen, it was destined by me for our much-esteemed friend Sir JOHN HERSCHEL. You will therefore perhaps have the kindness to transmit it to Sir JOHN, with my sincerest regards, by some fit opportunity. I have added (in the preceding extract) whatever little information Mr FAHN's letter contains on the subject. I shall write to Mr FAHN by this week's post, to send me the second specimen also, of which he speaks. If there be no *immediate* opportunity of forwarding it to England, it might perhaps be proper to exhibit it first at our next Institution meeting, as I have not yet had an opportunity of showing the stone to any of its members.—Believe me, my dear Sir, sincerely and respectfully yours,

J. WATERMEYER.

Chemical Account of the Cold Bokkeveld Meteoric Stone. By MICHAEL FARADAY, *Esq., D. C. L. F. R. S. &c., in a Letter to Sir* J. F. W. HERSCHEL, *Bart., V. P. R. S. &c. &c. Communicated by Sir* J. F. W. HERSCHEL, *Bart.*

Received March 7,—Read March 21, 1839.

MY DEAR SIR JOHN, Royal Institution, February 23, 1839.

I am at last able to send you a chemical account of the meteoric stone, leaving its physical characters (except some of those which bear upon the chemical results) entirely for your observation.

The stone is soft, porous, and hygrometric. A piece of it which, at common temperature, weighed 194·4 grains, by being perfectly saturated with water under the air-pump receiver, became 202 grains, and when thoroughly dried became 182·9 grains. In its most moist condition it had a specific gravity of 2·48, which, if abstraction be made of the water in it, would give a specific gravity of 2·94 for the dry stony matter.

It has a very small degree of magnetic power, and that is irregularly dispersed in the stone.

The heat of the mouth blowpipe sends off sulphur, and softens, but does not fuse it; a higher heat, after softening it still more, makes it run into a very fluid state, the globule when cold being black and opake.

The composition of the stone may be gathered from the following analytical results, calculated for 100 parts of the stone in its natural state:

Water	6·50
Sulphur	4·24
Silica	28·90
Protoxide of iron	33·22
Magnesia	19·20
Alumina	5·22
Lime	1·64
Oxide of Nickel	0·82
Oxide of chromium	0·70
Cobalt, a trace	
Soda, a trace	
	100·44

I have entered the *iron* above as protoxide, and nearly the whole of it is in that state. But there are portions, though very small, of metallic iron present. I could not collect more than 00·6 from 100 parts of the stone. Of this the largest portion was in very fine particles, recognisable only by their magnetic properties, and the evolution of hydrogen by dilute sulphuric acid; but there was one piece of sufficient size to show the malleability, lustre, and other general properties of the metal. This metallic iron contained nickel as well as the stone generally. A part of the iron in the stone was also in the state of sulphuret, as was evident by the sulphuretted hydrogen evolved on the action of acids.

The result with regard to the *sulphur* was obtained in the form of sulphate of baryta; but though I have entered it as sulphur only in the analysis, it did not all have that state in the stone, for a part of it was there as sulphuric acid. In fact, water only, when boiled with the stone, removed small portions both of sulphate of lime and sulphate of soda; and this was the case when, on repeating the experiments, I was very careful to take parts from *the middle* of the smaller fragment, parts which had not seen the light until I broke them out. It is a question, however, whether the soda belonged to the stone when it fell, and what proportion of sulphuric acid was in it at that time; for the stone being porous and hygrometric, the water and air in it may have converted a part of the sulphur into sulphuric acid; and as to the soda, I think it must have been acquired upon the earth; for the water separated also a portion of destructible organic substance, and the larger fragment of the stone still has small particles of insoluble vegetable matter adhering to it, having the appearance of being derived from manure.

I am, my dear Sir JOHN, yours most faithfully,

Sir JOHN F. W. HERSCHEL, *Bart. &c. &c. &c.* M. FARADAY.

FALL OF METEORIC STONES IN MARCH 1840, OBSERVED AT DINAGEPORE.

A correspondent of the *Englishman*, at Dinagepore, gives an account of a fall of meteoric stones at that station. The fall occurred at noon, and was accompanied by a rumbling noise, similar to that which precedes an earthquake, with this difference, that the noise was from *above*. Some of the stones were of considerable size, the largest weighing about four pounds. They were all much alike in appearance, with a thin black crust over them, as if they had been intensely heated. The sky was perfectly clear at the time of the fall.

METEORS OF 10TH SEPTEMBER, 1841, OBSERVED AT CALCUTTA.

About two in the morning on Friday last, innumerable meteors of surprising beauty were perceptible in the heavens. Vast myriads of shooting stars were seen darting through the air in a S. S. W. direction, leaving a long and brilliant train of light. The whole atmosphere was illuminated, and at one period the light was so great, as to have enabled a person to read the smallest print with the utmost facility. This magnificent spectacle was visible during a period of ten or twelve minutes.—*Englishman, September* 13.

METEORS OF 12TH AND 13TH NOVEMBER 1841, OBSERVED AT SIMLA.

Observations of Meteors, on the night between the 12th and 13th November 1841, *made at the Magnetic Observatory at Simla. Communicated by Captain* J. T. BOILEAU, *Engineers, F. R. S. &c. &c., Superintendent.*

The observed recurrence of numerous meteors on the same night, during a series of years, having led to a belief in their periodicity, it has become a special duty at all the fixed Magnetic Observatories to watch for their appearance, on the dates in question; the nights of the 10th August, and of the 12th November, have afforded the most remarkable instances of their recurrence, both as regards their number, and the regularity of the phenomenon. Our labours here, on the former night, were fruitless—not a single meteor having been visible; but the following account of those observed on the night between the 12th and 13th instant, confirms the fact as regards the latter date. It is to be hoped, should similar observations of these meteors have been made in other parts of India, that an account of their appearance may be forwarded for publication, in the Journal of the Asiatic Society, *without delay*.

Night between the 12th and 13th November, 1841. *By 3rd Assistant* C. NUTTALL.

8-15 P. M.—Brilliant meteors, to N. Motion moderate, direction from near the Pole-star perpendicularly downwards.

11-10 P. M.—Meteor NE. by N. altitude 1st appearance 30°, direction downwards.

11-15 P. M.—Meteor over head, direction downwards.

By 1st Assistant J. B. GRISENTHWAITE.

2-55 A. M.—A few luminous patches appeared from E. to N. E. at an elevation of about 30°. At 3h. 02m. A. M. they became more brilliant, and light was apparently pulsating through them; at 3h. 08m. assuming a dull appearance, they disappeared.

3.30 A. M.—Two dim meteors from Zenith downwards, direction N. E.

4-25 A. M.—Five bright meteors passed rapidly from Zenith vertically downwards, N. E.

By 2nd Assistant W. CRAIG.

On proceeding to the Observatory about 4-25 A. M. perceived a shower of meteors, and after taking the regular observations, recorded meteors as follows; viz.

1. From Zenith downwards, S.
1. From Zenith downwards, S. altitude of first appearance, 50°.
1. From Zenith downwards, E. altitude of first appearance, 40°.
1. From E. nearly horizontal to S. E. 40°.
1. From N. E., direction E., altitude of first appearance, 50°.
1. From Zenith towards E.
1. From Zenith, direction downwards to S. W.

The 2d Assistant observed in all about 30 meteors, chiefly in the above directions, but did not record them individually.

By Captain J. T. BOILEAU, *Engineers, Superintendent, at Strawberry-Bank, about* 800 *yards*

E of the Observatory.

4·50 A. M.—1. From α Hydræ, S. S. E. vertically downwards.
4·55 A. M.—1. Through Corvus vertically downwards.

5·03 A. M.—1. Between γ and λ Argus, small, vertically downwards.
5·05 A. M.—1. Through middle of Auriga, N. E. to S. W.
5·06 A. M.—1. From near α Leonis downwards E.
5·08 A. M.—In Argus as above, vertically downwards.
5·11 A. M.—1. From near Procyon S. vertically down.

5·13 A. M.—1. Near γ Columbæ, S. downwards.
5·25 A. M.—1. Very small from α Leonis towards S. E.

5·26 A. M.—1. Between α and β Cassiopeæ downwards N. N. E.

5·32 A. M.—1. Very rapid from Cancer through Gemini and past β Persei.
5·41 A. M.—1. Very faint from near Sirius downwards W. S. W.

5·45 A. M.—1. Faint downwards N. N. E. from between ξ and η Ursæ Majoris.

Day light interrupted further observations, though faint lines were occasionally observed as of the passage of meteors, for some time after the day had well dawned. The night was remarkably clear, free from clouds, and calm, and stars were particularly bright:—one meteor only was observed on the evening of the 13th November, and none had been seen for many nights before the 12th.—*Journal of the Asiatic Society of Bengal*, Part II., vol. x, 1841, pp. 964-966.

METEOR OF THE 11TH APRIL 1842, OBSERVED AT CHARKA.

Account of a luminous Meteor seen at Charka, lat. 24° 06′, *long.* 81° 20′, *on the morning of the* 11*th April* 1842. *By* Capt. Shortrede, 1*st Assistant G. T. Survey.*

A little before 4 o'clock this morning, I saw a meteor of a singular appearance, of which the following is an account:—

I was lying awake outside my tent, and about a minute or two before had closed my eyes, intending to have a short sleep before marching, when my attention was roused by some brilliant light before me. On opening my eyes, I saw a meteor having very much the appearance of a rocket: it was situated in the constellation Scorpio, having its middle about 10° to the westward of Antares, and pointing towards the constellation Corvus, the lower star of which was about 4° above the horizon. The meteor was about 10° or 20° long, and equally bright throughout except at the upper end, where it was rather faint. It continued in the same position, and of the same brightness, for between 2 and 3 minutes as well as I could judge, and then gradually became fainter and fainter, till it lost its brilliancy altogether: and as it began to fade, it began also to become crooked, and to move towads the west. It became gradually more crooked, and continued to fade till it became like a thin smoke, and at last vanished away at about 3° or 4° from the place where I first saw it. I listened attentively, but heard no noise. From the time I first saw it till its brilliancy ceased, was probably about 5 minutes, and in about 3 minutes more it ceased to be any longer remarkable.

I was then at Charka, in lat. 24° 06′ and long. 81° 20′.

Dewra, 11*th April*, 1842.

METEOR OF 16TH SEPTEMBER 1844, OBSERVED AT BOMBAY.

About a quarter past six on the evening of Friday, 16th September 1844, a beautiful luminous meteor, or fire ball, passed over the fort, and appeared to explode above the sands of Back Bay —about half-way betwixt the Cooperage and Malabar Hill. It was visible for about two and a half seconds, and seemed to travel from N. E. to S. W.: it was very low in the air, and emitted a greenish yellow phosphoric-looking light: as the sun had nearly set, the effect, though striking, was much less so in the strong twilight than it would have been half an hour later.—Bombay Times, Sept. 18, 1844.

METEOR OF 7TH DECEMBER 1846, OBSERVED AT BOMBAY.

A meteor ten times the brightness of Jupiter was seen at Bombay at daybreak on the 7th December 1846.

METEORS OF 7TH SEPTEMBER AND 29TH OCTOBER 1848, OBSERVED AT POONA AND BOMBAY.

On Sunday evening, October 29, about seven o'clock, a magnificent fire-ball was seen to shoot across the air from nearly west to east, when its horizontal motion suddenly ceased and it seemed to drop perpendicularly into the sea betwixt Mazagon and Sewree. At the time of its explosion—for such we may take that of its change of direction to have been—its illuminating power was equivalent to that of an ordinary-sized blue light: it dazzled the eyes of those near it and who looked at it directly; and though the evening was at the time perfectly dark, the most minute objects in the landscape were for ten or fifteen minutes made visible by it. It appeared to become extinguished some three or four hundred feet before touching the water. It left a long trail of light behind it, which was visible for the space of nearly half a minute. On the 7th September, about half-past six P. M., a large fire-ball was seen at *Poona* to shoot from nearly north to south: it then made a sudden sweep, and proceeded nearly at right angles to its previous path. After being visible for five or six seconds, it split into a number of large fragments, which rapidly descended towards the earth; and these again broke up into lesser fragments, till they appeared to descend in a *shower of sparks*. Before the first bursting the meteor was of exceeding brightness, of an intense blue colour, and at the instant of explosion it changed into red:—it seemed to light up the whole heavens, though the moon was shining, so as to render the lesser stars visible.—*Bombay Times, November* 1, 1848.

METEOR OF THE 24TH FEBRUARY 1848, OBSERVED AT MADRAS.

A large Meteor was seen at Madras on the 24th February 1848.

METEORS OF 10TH AUGUST 1842, OBSERVED AT ALLAHABAD.

Meteors observed at Allahabad on the 10th of August, 1842. *By Captain* SHORTREDE, *1st Assistant, Grand Trigonometrical Survey of India.*

The following observations were made at Allahadad, for the purpose of comparing them with corresponding observations to be made at Agra, but the gentleman at whose suggestion the observations were undertaken, was unable, from sickness, to take an active part in the business. Though the primary object was thus frustrated, it may be worth while to record these observations, with a view of calling the attention of those who may have opportunities of making similar observations about the 10th of August and 13th of November next.

The first step towards a knowledge of these meteors is a large collection of facts, and it is not to be overlooked, that in this country we have advantages for such observations which are scarcely equalled in any other part of the world, owing to the general clearness of our sky, the extent over which observations can be made, and the facility of intercourse by our common language, and the post routes everywhere.

The observations themselves are very easily made when a person knows exactly what he has to do, and does not allow himself to be distracted by attempting too much. Besides general attention, the most useful qualification I believe to be, the ability readily to estimate altitudes at sight. I know by experience, that persons in the habit of such observations may train themselves to estimate altitudes at sight within 2° of the truth, for I have practised it along with another person, proving our estimates by an altitude and azimuth instrument. In the present observations, the altitudes I believe to be within 5° of the truth, and the azimuths within 15°. But as the meteors come sometimes very quickly after each other, there is no time for deliberation, and it becomes necessary to write down at once whatever is to be recorded, so as to be ready for the next.

In order to judge of the azimuths, I had my cot put in an open place, and laid duly East and West, because I had a straight road, with well marked objects in that direction. I lay on my back, and had a faint oil light on the ground, just sufficient to let me see my watch and what I was writing. I wrote lying on my back, and holding the paper over my head, and in this way saw several meteors which otherwise would have pass unnoticed.

It is an obvious fact, to whatever conclusions it may ultimately lead, that a considerable majority of these meteors have a Westerly course in or near to the Zodiac. Such being the case, it is desirable that some observers should be situated as nearly as may be at right angles to the Zodiac, and at considerable distances from each other, in order that the errors in estimating the altitudes have the least possible effect on the computed heights from the surface of the Earth.

In order that meteors observed at distant places may be readily identified, it is desirable that observers should set their watches either to mean or to apparent time, by means of an astronomical observation, or by a well-set sundial. Provided it be distinctly stated, whether the watch shews mean or apparent time, it is of no great importance which is used; though as a general rule, apparent time is the most convenient for meteorological observations, because the tides, &c. of the atmosphere, like those of the ocean, have a direct relation to the apparent, rather than to the mean course of the sun.

Appt. Time of Obser.	Origin. Alt.	Origin. Az.	Course.	Length.	Remarks.
h. m.					
11·18	70°	S W	Nearly vertical.	25°	Faint.
11·23	40	S W	Vertical.	10	Very faint.
11·34	45	S W	...	15	Faint. [Jupiter, train visible for one or two seconds.
12·20	70	S	...	...	Splendid from meridian 20° S. of Zenith towards 20° S. of
12·23	...	...	...	5	Very small; from 20° S. of Zenith towards Jupiter.
12·27	...	...	...	8	From 15° N. of Zenith towards Jupiter, faint.
12·39	45	N	West.	10	Small.
12·41	70	...	W 20 N	6	Faint, ended at 10° S. of *a* Cygni. [2½° above horizon.
12·42	...	...	N	10	From Milky Way between *a* Cygni, and *a* Pegasi. Sky clr.
12·50	90	...	N	8	Faint.
12·54	45	N	...	...	Very faint, towards *a* Cygni.
12·58	...	...	Westerly	...	From 10° E. of *a* Pegasi.
12·59	32	N	...	...	From 8° above Pole-star: faint.
13·00	...	...	Westerly	...	From 20° N. of *a* Pegasi: faint.
13·04	30	W 20 S	W 35 S	...	
13·08	50	W 15 N	W 25 S	10	
13·15	80	S	S W	15	Faint: cloudy towards N. and heavy E.
13·19	24	N 5 W	N W	5	Faint.
13·22	...	...	W N W	5	Faint: from 5° N. of Altair.
13·25	40	N	W	15	
13·28	65	N	N	10	Faint.
13·30	60	S W	S W	10	Very faint.
13·30½	70	S	W 20 S	45	Brilliant.
13·39	20	W	W	...	Rather bright, but short.
13·48	35	W 20 N	...	...	From 8° S. of *a* Cygni.
13·49	...	...	...	...	Faint from near Zenith towards S. W.
13·56	...	...	...	...	From 15° S. of *a* Cass., cross meridian from 10° E. of Zen. to 40° below Zen. towards 40° S. of Jupiter.
13·57	60	S	S 20 W	...	Towards Fomalhaut.
14·01	75	N	...	...	Towards 30° W. of Fomalhaut.
14·02	...	S W	...	...	Another—uncertain.
14·04	90	...	...	...	Two from near Zenith, towards 20° W. of Fomalhaut;
14·04½	...	...	...	...	both faint. [Jupiter, length 20°—2d Northwesterly.
14·08	...	...	...	...	Three within 20°s; 1st and 3d from 10° W. of Zen. towards
14·09	45	S W	...	...	Towards 5° S. of Fomalhaut.
14·12	...	...	...	...	From 15° S. of Altair to 10 S. of Jupiter.
14·13	40	S 60 W	S W	...	
14·14½	...	...	...	...	Three; two of them S. W., the other N. N W., general-
14·17	60	S	S W	25	[ly altitude about 40° at origin.
14·18	...	S W	...	...	One S. W.; direction S. W. oblique.
14·18½	...	N W	...	...	One N. W., nearly vertical.
14·19½	40	...	W	...	10° N. of Altair, direction West, vertical. Sky clear to-
14·22	45	S	S W	...	[wards N., cloudy in E. horizon.
14·23	60	S	...	...	Bright from 30° S. of Zenith towards 15° E. of Fomalhaut.
14·24	...	...	W	...	In Milky Way near *a* Pegasi.
14·26	70	S	...	...	Two, 20° S. of Zenith, direction S. W.
14·26½	70	S	...	...	
14·27½	...	...	...	...	One N. W.; somewhat uncertain.
14·28½	...	...	S W	...	From *a* Arietis.
14·31	75	S	...	...	From 15° S. of Zenith towards *a* Ceti.
14·32	45	S W	S W	...	From alt. 45° S. W. to 2° N. of Fomalhaut.
14·34	90	...	...	...	Brilliant from Zenith to between Fomalhaut and *a* Ceti; train luminous for about 10 seconds.
14·35	50	N W	...	...	In Milky Way at 40° N. W. from Zenith, direction in
14·39	50	S S W	...	...	Towards Fomalhaut. [Milky Way Westward.
14·42	...	...	...	...	Small, at 35° about *a* Cygni in Milky Way.
14·44	...	...	N E	...	Corruscating in Zenith, direction N. E.
14·44½	80	S	S W	...	From 10° S. of Zenith.
14·48	...	...	W 35 S	...	From 10° S. of *a* Cass. direction W. 35° S.
14·49½	...	...	...	...	From N. of Zenith towards Ceti. Cloudy and heavy all around, except to N.—Left off observing.

—*Journal of the Asiatic Society of Bengal*, Part II., vol. xi., pp. 959-962.]

METEORIC STONE WHICH FELL NEAR EIDULABAD, IN KHAUNDES, IN JULY 1843.

An account of a remarkable Aerolite, which fell at the village of Maniegaon, near Eidulabad in Khandeish. Communicated, with a specimen, to the Asiatic Society, by CAPTAIN JAMES ABBOTT, B. A., *late Resident Nimaur.*

A Chemical Examination of the above Aerolite, and Remarks, by HENRY PIDDINGTON, *Curator Geological and Mineralogical Department of the Museum of Economic Geology.*

At the Meeting of October, 1844, Captain Abbott communicated to the Society the following documents, with two small specimens of the Aerolite.

CAPTAIN J. ABBOTT, *Artillery, Dum Dum, to the Secretary Asiatic Society, Calcutta.*

Dum Dum, Sept. 16th, 1844.

Sir,—In July 1843, I received at Mundlaisir, from the Komardar (or Native Collector) at Asseer, a report of the fall, in that part of the country, of a meteoric stone, together with a few grains, said to be particles of the same. I immediately dispatched a Karkoon to the spot, to ascertain the truth or falsity of the statement, and to collect specimens of the supposed Aerolite. These accompany my letter. They differ so much from the structure of every reputed Aerolite I have previously met with, that I should be inclined to doubt the veracity of the reporters, could I discover any other reason for questioning it. I have never heard any other instance of an Aerolite in that neighbourhood. The fact is implicitly credited in the neighbourhood of Eidulabad, where it is said to have occurred. These specimens appear to me to resemble masses of friable rock of the quartz family, which I have met with in Malwa. But it is evident that a mass of texture so loose could never have borne unshattered, the propelling agency of fire, nor has any volcano existed within the memory of man in Nimaur or Mahiswah, nor I believe in Khaundes, although fable declares Oojyne to have been buried beneath a shower of mud, and Mahiswah to have been destroyed by the mischievous malice of a demon. The depositions of the observers I have translated and appended. The spot was beyond my district, or I would myself have visited it. It is probable that the collector of Khaundes may have reported it to the Bombay Society.

This report, and the note upon granite in the Nurbudda, were prepared many months ago, but restricted leisure, and many concurring events, prevented their being forwarded.

J. ABBOTT, *Capt., Arty.*

Fall of a Meteoric Stone in Khaundes.

Deposition taken by a Karkoon, despatched from Asseer by Capt. James Abbott, to collect information upon the subject.

Oonar, Puttail, and Ghubbaljee, Chowdry, of village Maniegaon, purgunnah Eidulabad, Tuppeh Sowdah, Illaqah Dhooliah, in Khaundes, depose as follows.

Taken July 26th, 1843.

On Mittee Asarr, Soodee Teej, Goraur ke din.

We were in our house. At 3½ o'clock P. M., whether from heaven or elsewhere, a prodigious ball (ghybee golah) fell. The noise it made was very great, it might be heard twenty miles round. We heard it with our own ears, and in fear and trembling ran outside to look, as running out we found that it had fallen outside the village on the Southern aspect, and that in falling it had been shattered to pieces, some of which had been scattered far. We put our hands upon that which lay together, it felt cool; shortly after it became rather warm. When first we saw it, the pieces were black; after a day's interval, the color changed to blue, and now the fragments are white.

Question. When the ball fell, was any flash perceptible, or was the heaven darkened? Who saw it fall? How large was it? And who heard the noise at the distance of 20 miles?

Answer. We *saw* nothing. When the ball fell, we heard the noise, and ran to see what had caused it. The spot on which it fell was hollowed by the shock, a span and half in diameter and three fingers breadth in depth. The ball was about the size of a kedgeree pot (ghurrah, i. e. about ten inches in diameter); the people of Eidulabad and of other parts heard the noise in the clouds, at least so they say. The ball being shattered, people came, and carried away the pieces. The remainder was sent to the Sowdah Komardar, and *by* him to Dhooliah. What remains I give you.

True and literal translation.

J. ABBOTT, *Capt.*,
Mundlaisir, August 1843. *Pol. Asst. in Nimaur.*

Note.—A few grains of this Aerolite were first sent me by letter from Asseer. I despatched a Karkoon immediately to the spot to make enquiries, and collect as much of the fragments as possible, supposing that he should have cause to believe the report well founded. The greater part of what he collected accompanies this report. It agrees exactly with the grains first sent me.

J. ABBOTT.

At Captain Abbott's suggestion, the Collector of Khandeish, J. Bell, Esq., Bomb. C. S., was written to, and he has kindly forwarded us a few small fragments more, with the following letter and deposition.

To W. W. BELL, *Esq., Collector of Khandeish.*

Sir,—With reference to your Mahratta Yad of the 5th ultimo, with enclosure from the Secretary to the Asiatic Society of Bengal, requesting me to transmit any information along with specimens procurable of an Aerolite that fell in the month of July, 1843, in the vicinity of the village of Manegaum of this talooka, I have the honor to transmit translation of a deposition given before me, by a couple of individuals who were spectators of the fall of the Aerolite in question, along with five small specimens of the same, all that I have been able to procure after much search; these however I trust will be sufficient to indicate the nature of the Meteorolite.

I beg to return your enclosure, and to remain, Sir, your most obedient servant,

C. INVERARITY, *Actg. 1st Assist Col.*

Camp, Circuit at Rawere, Talooka Jooda, January 1st, 1845.

Translation of a deposition given in Mahratta, by Gobā Wulud Nagojee Chowdrie, and Hunmunta ud Dama Naik Solie, inhabitants of the village of Manegaum, Pergunnah Eidulabad, taraf Jaoda, of the Khandeish Collectorate, who were spectators of the fall of an Aerolite in the vicinity of their village, in the month of July 1843.

On the day the Aerolite fell we were both seated, about 3 o'clock of the afternoon, on the outskirts of the village, in a shed belonging to Ranoo Patel. There was at the time no rain, but heavy clouds towards the Northward; there had been several claps of thunder for about two hours previously, and some lightning. Suddenly, while we were seated in the shed, several heavy claps of thunder occurred in quick succession, accompanied with lightning, on which we both went out to look around us, when in the middle of a heavy clap, we saw a stone fall to the ground in a slanting direction from North to South, preceded by a flash of lightning. It fell about fifty paces distant from us; on going up to it we found that it had indented itself some four or five inches in the ground; it was broken in pieces, and as far as we could judge, appeared to be about fifteen inches long and five in diameter, of an oblong shape, somewhat similar to the *chouth*ā grain measure; it was of a black vitreous colour outside, and of a greyish yellow inside; it was then of a mouldy* texture, and hardened to the consistence of the present specimens afterwards. Only one stone fell. No rain had fallen for eight days previously, nor did it, until four days after the fall of the stone. It had been warm all day before, but not much more so than usual. From midday until the time the stone fell, (3 P. M.) it was very cloudy towards the northward; after its fall, the thunder ceased, and the clouds cleared away. No stone of a similar description had ever fallen near our village before. The pieces of the stone were immediately after carried off by the country people. Our village is situated on the banks of the small river the Poorna; there are no hills in its vicinity, the nearest being three coss (or 6 miles) off. The above is a true statement, dated at Rawere, talooka Jaoda, on the 17th December, 1843.

(Signed.) GOBA UD NAGOJEE CHOWDRIE.
" HUNMUNTA UD DAMA NAIK.

True translation of the deposition given before me on the above date,
C. J. INVERARITY, *Actg. 1st Assist. Col.*

CHEMICAL EXAMINATION.

The specimens were referred to me for examination, of which this is my report.

The specimens are mainly composed of an earthy greyish white, pulverulent mass, slightly tinged with a bluish grey in some parts. It is excessively friable, and both crumbles and soils the fingers even when most delicately handled. In the earthy mass are thickly imbedded light, greenish, glassy particles of olivine, single and in nests, resembling green mica or felspar; the appearance in some parts being almost that of an earthy variety of Lepidolite. On the side of one piece of Captain Abbott's specimens, is a bright black crust thickly but minutely mammillated. When this is touched with the file, it leaves a rusty mark, but gives no metallic trace. This crust is exceedingly thin, and splinters off, and in one place a mass of the olivine in it is melted to a green bead. It is too fragile, and our specimens too small, to attempt obtaining sparks from it. Two of Mr. Bell's fragments also have small portions of crusts not adhering to them.

Internally and by the magnifier, a few bright white metallic points are discoverable, and in one or two places small nests of it; there are also a few of a brown kind. We have one fragment of an Aerolite which fell in 1808, at Moradabad, which is pulverulent, but not so much so as the present specimen by a great deal. The present specimen is in this respect almost unique, as the only one I now recollect to have read of as very pulverulent, is the one from Benares, mentioned in the Philosophical Transactions.

The Aerolite of Moradabad is studded over with rusty specks from the oxidation of the iron. All our other Aerolites are of a compact texture. I may note here, that we now possess in our collection, ten specimens, comprising six varieties of Aerolites, and four of Meteoric Iron from Siberia, Brazil and India. One of the Society's Aerolites is also well entitled to be called Meteoric Iron, as it consists mainly of that metal, (and no doubt Nickel) rather than an Aerolite, by which we usually designate the more earthy looking stones.

The magnetism of the Kandeis Aerolite is no where apparent except at the patch of pyrites (magnetic Pyrites?) on the piece which has the crust, but here it is strong and distinct.

From its extreme friability I have not ventured to take its specific gravity, which is about 4 or 4.5, I judge, for it might crumble to pieces in the water, and is too rough and tender to admit of varnishing. Specific gravity however is an indication of no value in those heterogeneous compounds.

The green crystals, when examined separately, effect a somewhat rhomboidal or cubical form, but none are clearly defined. Their color is a bright, clear, and very light grass-green.

List of Meteorolites in the Collection of the Asiatic Society, 1st January, 1845.

1. Fell at Moradabad 1808, Captain Herring. One piece of this is rather friable. 3 pieces.
2. Dr. Tytler's Aerolite at Allahabad, 3 large pieces.
3. Aerolite fell about 40 miles to the West of Umbala, between the Jumna and Punjaub, 1822.3. Obtained by Captain Murray; given by Mr. J. Bird, to Mr. Craeroft.
4. Fell at Bitour and Shapoor, 75 miles N. W. of Allahabad, 30th November 1822.
5. Fell at Mhow, Ghazeepore, February 1827, R. Barlow.
6. Fell at Manogaon in Khandeish, July 1843, Captain J. Abbott, B. A., and J. Bell, Esquire, Bombay C. S., Collector of Khandeish.

Meteoric Iron, or Stones having a large proportion of it.

1. Meteoric stone containing Iron and Nickel, fell at Tanganoor in 1811. Mr. Ross of Cuddapah.

* So in MSS. Perhaps muddy, *i. e.* soft, earthy texture was meant?—H. P.

2. Meteoric iron, Siberia, Pallas.
3. Ditto ditto Sergipe Brazil, Mornay and Wollaston.
4. Lightning stone of Nepal, not examined, but may be Meteoric.

BLOWPIPE EXAMINATION.

The grass-green crystals above described: Per se infusible, but take a rusty brown appearance, as of semi-fusion or oxidation, on the exterior, remaining still translucent. *On Platina Wire*, with borax and phosphate of soda, fuses at first in part only (a lump remaining), giving a light clear olive glass; adding more of the flux, it finally dissolves with various shades of olive and grass-green according to the proportions of assay and flux. A minute crystal in Mur: acid does not soften, gelatinise, or colour it by several days digestion. These are doubtless Meteoric olivine.

The white friable part, taken as free as possible from the grey specks and entirely so from the green crystals. *In the forceps* slightly oxidates to a rusty appearance at the outer part, but does not fuse.

On Platina wire and with Soda. Fuses to a dirty olive coloured bead, which in the reducing flame gives metallic iron with some earthy residuum. With Nitrate of Cobalt only a dull rusty colour. Hence the absence of Alumina, except perhaps in very minute proportion.

The metallic looking vein was assayed in various manners for Nickel, but no trace of it could be elicited, the vein being apparently pure pyrites. Nickel may nevertheless exist, though in small proportions, and we cannot venture on consuming more of these precious fragments, since the fused crust, the olivine, and the white matrix, are chemical evidence enough of the meteoric origin of the stone.

The whole of the dust which had collected in the paper, being carefully collected, was assayed both by the blowpipe and *via humida* for Chromium, but no traces were detected. As said of Nickel however above, so also of this substance: it may exist in minute proportion, though not detectable in such extremely small assays. H. PIDDINGTON.

ACCOUNT OF AN ÆROLITE WHICH FELL IN THE DHARWAR COLLECTORATE ON THE 15TH FEBRUARY, 1848.

THE following letter was received from Captain George Wingate, of the Bombay Engineers:—

"I beg to transmit two fragments of an aerolite, which fell about one o'clock P. M., of the 15th February last, in a field to the south of Negloor, a village situated within a few miles of the junction of the Wurda and Toomboodra rivers, and belonging to the Gootul division of the Ranee-Bednoor talook of the Dharwar collectorate.

"The fall of this aerolite is almost satisfactorily established. A cultivator of Negloor, named Ninga, was driving his cattle out to graze close by where it fell, at the hour above mentioned, when he suddenly heard a loud whirling rushing noise in the air, but on looking up could see nothing. An instant afterwards, however, he observed a cloud of dust rise from a spot in an adjoining field, as if something had struck the ground there with violence. At this time several other villagers were standing by a threshing-floor close at hand, who also heard the noise, and one of them called out to Ninga asking whether he had also done so. He replied yes, and that something seemed to have fallen in the next field, where he saw the dust rise, pointing at the same time to the spot. The whole party then immediately proceeded there, and found to their astonishment the aerolite broken into fragments, of which those now forwarded were a one of any considerable size. The stone, from the velocity of its descent, had made a hole of several inches in depth,—like the print of the foot of a young elephant, as the villagers described it. They were naturally much puzzled to account for the appearance of the stone, which altogether differed from any to be met with in their neighbourhood; but at length were constrained to conclude that it had fallen from the sky. The circumstance seemed so extraordinary that one of them was immediately sent to summon the Patel of the village to the spot, who soon arrived, attended by a crowd of people who had also heard the wonderful tidings. These too unanimously adopted the same conclusion regarding the fall of the stone, and the Patel took into his charge the accompanying fragments, and wrote a report of the whole circumstances to the Mahalkurree of Gootul, who is revenue and police officer of the district in which Negloor is situated.

"The Mahalkurree thought the Patel's report so extraordinary that he determined at once to proceed to Negloor himself, to enquire as to its truth, which he did. And after having examined the stone itself, as well as the hole in the ground made by its fall, and found all the accounts of the villagers who were present to agree, he could not avoid coming to the same conclusion that they did, regarding its fall from the sky. To place the matter beyond doubt, however, he took statements in writing of the circumstances from the cultivator Ninga and another, who had heard the rushing noise made by the stone in its passage through the air, and forwarded their depositions, with his own report and the fragments of the aerolite, to Mr Goldfinch, the assistant collector and magistrate in charge of the district, who has kindly placed them at my disposal.

"Had the evidence in proof of the fall of this stone been less conclusive than it is, we might still have inferred the fact of its being an aerolite from its peculiar appearance, so different from that of any rock in the neighbourhood of the spot where it was found. For miles around the village of Negloor, the only rocks to be found are primary clay slate of various degrees of induration, and occasional dykes, masses and boulders of greenstone, but not a trace of any volcanic product, or other stone bearing the remotest resemblance to the one under consideration. The latter, however, tallies exactly with the descriptions given of aerolites.

It is coated with the fused crust or film characteristic of these bodies, and is evidently highly metallic. On the theory of aerolites being planetary bodies which become fused on their surfaces, and burst by the sudden evolution of heat occasioned by their rushing at immense velocities into our atmosphere, the specimen now forwarded may be supposed to have formed a part of a globe, or rather mass approaching the spherical shape, of somewhat more than a foot in diameter, which burst into fragments under these circumstances; and the difference in appearance of the position of the fused film over the rounded part of the specimen, which may be considered to be a portion of the surface of the original globe, and of that coating the remaining parts, which according to this view were the rough broken surfaces of the detached fragment, would seem to favour this explanation.

"These remarks, however, are merely thrown out in the way of conjecture, as I do not pretend to any knowledge that would entitle me to theorize on the subject at all. My object in writing at so much length has been to shew that the specimen now sent is part of a true aerolite, and as such, I hope it will be thought worthy of a place in the new Museum."

The mass of stone which accompanied this was somewhat ovoidal; it weighed four pounds, measuring fifteen inches round the larger, and eleven round the shorter, axis. It was covered over with a black-looking vitrified crust, about one-twentieth of an inch in thickness. This refused to yield to the action of muriatic, nitric, or sulphuric acid. One end of it was marked with impressions such as a slightly softened body might receive on being thrown violently against the earth. The sp. gr. of the crust was a little over three, or somewhat heavier than marble: it had not been quite accurately determined, from the difficulty of separating the crust from the interior. The interior of the aerolite was exactly like soft ish white sandstone—it crushed between the fingers, and absorbed, when immersed an hour in water, one-hundredth of its weight. Its specific gravity was 3·5, or a third heavier than the heaviest sandstone; that of quartz being 2·6. It slightly effervesced with muriatic acid, giving off much sulphuretted hydrogen gas, and then slowly dissolved into a glairy mass. It seemed full of metallic particles, which shone beautifully under a moderate magnifying power, with direct light. The following note by Dr Giraud gives particulars of the results of the first examination of its characters:—

"The stone is acted on by cold hydrochloric acid, with disengagement of sulphuretted hydrogen. Boiling, but not cold, nitric acid acts on it violently, disengaging HS and NO4. The great mass of the stone is silica: the metallic granules consist of iron in large proportions, with nickel and chrome—in fact, meteoric iron. The nickel of course is much obscured by the iron: the chromine was readily detected, for on fusing the stone with nitre, dissolving the fluid mass in distilled water, and then testing with acetate of lead, a fine yellow chromate of lead was obtained. On fusing the stone with nitre, chromate of potash was of course produced. I cannot detect any cobalt, which you know Stromeyer found in the mixture of iron at the Cape of Good Hope."—*Bombay Geographical Transactions*, Vol. VIII., p.p. xl.-xliv.

THE METEOR OF 19TH MARCH, 1849, OBSERVED AT BOMBAY, POONA, AHMEDNUGGUR, SURAT, ASSEERGHUR, &C.

It was not unlikely to be a Meteor &c.—I (with others) was to the north-east of the Police Hulk on the evening in question, and saw the Fire-Ball, which appeared to rise from one of the ships laying nearest to Mazagon: in all other particulars E. is correct.—I may also be mistaken; and if so, then this brilliant Meteor might have been at any distance you please in the North East, though we fancied, as E. did, that it was within three hundred yards of us. To clear up the point, perhaps the ship-masters in the part of the harbour indicated would be kind enough to state if a rocket was fired by them on the evening of Monday last between 6 and 7. F.

SIR,—Your correspondent "E." is perfectly correct in his statement regarding the "Meteor" he saw on Monday evening. On that evening as I was taking a walk with a friend of mine, on the Grant Road "Flats," my attention was attracted to, as if it were, a Planet of the size of a common-sized hen's egg. A second or two did not elapse from the time I saw it whole, till it burst; and the light that it shed was unusually brilliant for a Meteor. I may here mention, that we were not the only persons who saw it, for on my going to the Fort the next morning, a friend of mine told me that as he was spending the evening at *Mazagon*, he saw just what I have related. If any one versed in astronomy has seen this, it would be well if they would explain it to— G.

SIR,—In the column of correspondence in the Bombay *Times* of the 21st, I see a letter mentioning the appearance of a luminous Meteor at 6½ P. M. on Monday the 19th instant—A Meteor answering the description therein, was seen by a friend of mine about the same hour on that evening in a N. E. direction.—It was first seen in the form of a ball about the size of a large egg, darting towards the earth: it broke into numerous small brilliant fragments, and disappeared. It was visible about half a minute. I send you this as I see you express a desire for further information on the subject.—Poona, 22nd March. S.

SIR,—None of the Bombay accounts sent you of the aerolite which fell on the 19th are sufficiently explicit. Most of your correspondents must have seen it crossing their meridian: can none of them estimate its *angular height* at that moment? I am not very well acquainted with your localities, but the meteor would seem to have been north of you, and at no great elevation. Supposing it to have had a meridian altitude of 20°, and combining this with the data we sent you two or three days ago, you will find that it must have been about 30 miles high (perhaps 10 when it burst,) and taking its apparent diameter at 4′, must have measured nearly 200 yards across—an enormous mass, sufficient to furnish on exploding a very large shower of meteoric stones. It appeared to pass over about 30° of the heavens in something less than two seconds; and this, at the distance at which it must have been, if the data we have here assumed are anything near the truth, will give a real velocity of 30 miles per second.

The theory of these bodies, which considers them as moving through space, and becoming hot and luminous on entering our atmosphere, from the rapid compression of the air, would seem to be pretty consistent with all this.

P. S.—I will just add a word or two concerning the probable errors of these estimates. The *height* and *velocity* are certainly if anything understated, while on the contrary the volume assigned is not unlikely to be considerably in excess; since the apparent magnitude may have been partly an optical deception, or may have been that subtended—not by the meteor itself, but by its luminous envelope.—Surat, March 27th, 1849.

The following extract is from a letter received a month since from Hoshungabad, dated 6th April: can it be that the thick dust which filled the air betwixt the 28th March and 2nd April was the debris of the Meteor of the 19th?

"From the 23th March to the 2nd of this month a haze, occasionally very dense, has covered the station. The opposite hills were sometimes invisible, and the sun could be viewed with the unprotected eye until he attained an altitude of 30 or 35°, having all the appearance of a disc of silver, and the same transpired when about an equal number of degrees above the western horizon. On these days an impalpable dust fell and covered all things. Not a cloud was to be seen, but this uniform and general haze mantled everything day and night,—the moon and some stars of the first magnitude only being visible at night. Barometer slightly lower, dew point steady, electricity abundant, and a gentle breeze chiefly from the W. The days felt oppressive, and notwithstanding that the haze intercepted the full play of the solar rays, the black bulb thermometer reached 120° on the 30th."

Sir,—So the lingos of Bombay suppose the Meteor the other evening was on leave at the presidency? Why we up here claim him as a Mofussilite,—so whose is he, between us both? I saw it on the 19th at about 6.30 P. M., away in the S. W., high up in the heavens, falling with great velocity towards the earth, but directed to the N. E. It was intensely brilliant, of a bluish white color, like a Roman candle, bursting into a sparkling shower of a dull red color. We heard no sound after it burst here, but at Aurungabad, some considerable time afterwards, a sound as of distant thunder was distinctly audible. Everybody differs as to the time: some minutes—say three—elapsed: that will take us just about to the region of fire balls, for assuming 1125 as the rate sound travels per second, three times that will reach about to the cropuscular atmosphere, the nursery of these Meteoric bodies. At Aurungabad his course appeared northward, passing over the heads of the good folks there, and bursting about 20 miles to the North of the station.—Boldanah, 1st April, 1849. W. H. B.

Sir,—On the evening of the 19th ult. between 6 and 7, I observed the Meteor alluded to in the *Times* of 23rd and 26th March. I was in Latitude 21° 58′ (by observation next day), and Longitude 76° (taken from a map.) The Meteor was, as well as I can judge, S. W. by S. It was very brilliant. The Longitude I could not work out exactly, not having the necessary tables.

Mundlaisir, 5th April, 1849. L. H. E.

Sir,—Your correspondent of the 21st inst. desires information about "a supposed meteor." It may be gratifying to him to know, that we were favored, back here in the country, with one, of whose personal identity we could have no doubt. It appeared six miles east of Ahmednuggur, in the vicinity of a hill known here by the name of "Shaha Donger." The fall of a more splendid meteor I never had the pleasure to witness. Myself riding eastward, its line of direction declined towards the same point, the meteor appearing at right angles on my left. It first invited my attention by throwing across my pathway a brilliant light, seeming for the instant to light up the whole horizon. Instantly glancing to the North, the stranger appeared in full view, a beautiful globe of fire, apparently 60 to 80 yards high, and some three inches in diameter, with a long tail of bluish and red light. At the height of 20 to 25 yards it burst, and fragments of a brighter red were visible an instant longer.

The proximity of the hill enabled me to determine its distance to be within 300 yards, the meteor being distinctly visible after passing below the summit. The coincidence which will perhaps most interest your correspondent is the fact of its appearance at *thirty-five minutes past six* on *Monday evening* (19th inst.) W.

Ahmednuggur, 24th March 1849.

Sir.—In your issue of Wednesday last I observe, a correspondent notices a Meteor he had seen in Bombay about half past six P. M. on the preceding Monday. As you appear anxious for further information on the subject, I send you the following, though I know not if it be worth much. On the same evening, and about a quarter before seven (of *our* time,) I saw from hence a Meteor, answering in so many respects that described by your correspondent, as to leave no doubt on my mind but that it was the same as attracted his attention. To my eye the Meteor appeared in size rather less than a man's fist—its brilliancy was excessive, and it was surrounded by a colour more yellow I think than green. The flakes it threw off were very large, and strewed its path, so as to form a long and most luminous tail. I note the following particulars:—commencement of course at a height of about 50 degrees; end of ditto 20 ditto; direction of ditto nearly perpendicular; direction from Asseer about S. S. W. If I mistake not your correspondent, he makes its direction from Bombay to have been about easterly; by a glance at a map I should, therefore, suppose the Meteor would be vertical over some spot between Jooneer and Kandhalla.—Asseerghur, 26th March 1849. A. W.

A Mahabuleshwar correspondent describes the weather as most agreeable at the Hills, where the visitors seem all to be highly enjoying themselves. The Meteor seen there on the 19th ultimo, presented nearly the same appearance at Malcolm Peth as at Bombay.

Sir.—The same appearance as that described by your correspondent E. in your paper of the 21st., was observed by myself and others from this place on the evening of Monday the 19th, about the same hour mentioned by him, and in a south-westerly direction.

Fortress of Asseerghur, 28th March, 1849. W. R. M.

SIR,—I suppose you have had enough of the Meteor of the 19th instant, but I cannot forbear writing to let you know that it was seen at Ahmednuggur also at the time mentioned by the other observers. I was driving, at the time, about a quarter of a mile distant on the west side of the fort, when I observed the meteor towards the N. E. It did not occur to me that it was anything more than a rocket thrown up from the native town, and I was sure it had fallen between myself and the fort. I have been much interested in the accounts sent by your correspondents from such distant places as Sholapoor and Surat,—most of them supposing as we did here that it was not very distant. Were proper measures taken for simultaneous observation of such meteors at different places, it would be easy to ascertain by a little calculation the height at which they begin to appear and at which they burst, and the velocity with which they move. The apparent velocity of this meteor being so great, while at the same time it was so distant, its real velocity must have been great indeed,—more nearly approaching that of electricity than that of any solid body whose velocity has hitherto been calculated.

Ahmednuggur, 31st March. 1849. B.

SIR,—The accounts received by you from different stations regarding the appearance, and supposed course, of the magnificent Meteor of Monday evening the 19th instant, induce me to add my evidence, with the view of assisting in the determination of the true course of the luminous object. About 6¼ P. M. I happened to be seated in the open air, facing due south, and the "shades of evening" were fast closing over head when I observed a Meteor, which, apparently commencing its course at a point bearing about S. S. W. and about 30° above the horizon, darted in a slightly descending line, and with different degrees of brilliancy, towards a point bearing about S. S. E. and about 15 or 20° above the horizon; and there burst without any perceptible noise into spark-like fragments, flame-coloured, which immediately disappeared. The colour of the Meteor when most brilliant appeared to me not unlike that of the ordinary "blue light." The observer at Aurungabad (near which place the Meteor appears to have burst) does not mention the apparent *length* of the course of the luminous body. If this was not very great, nor the apparent motion of the Meteor very rapid, it seems to me not improbable that the course of the Meteor was seen at Aurungabad *fore-shortened* as it were; and taking into consideration the various accounts, I am disposed to think that a line drawn from the Malsej Ghaut (or a point half way between Nasik and Joonneer) in the direction of Ellora would pretty well represent the course of the Meteor; and it is not unlikely that fragments of the aerolite may be yet found near the caves. H. W. B. B.

Malligaum, 30th March, 1849.

METEOR OF 4TH APRIL, 1849, OBSERVED AT DELHI.

A very brilliant meteor, of a deep red colour, was observed at Delhi on Wednesday evening at a quarter past 7. Its progress was extremely slow, from N. W. to S. E., and the inclination small. It seemed to have become extinct for an instant, and then assumed greater brilliancy before its final disappearance. The elevation at which it was noticed, cannot have been more, than 28 or 30 degrees.—Delhi Gazette, April 7.

METEOR OF 10TH APRIL, 1849, OBSERVED AT AHMEDNUGGUR.

AHMEDNUGGUR, 11*th April*, 1849.—You may be interested to hear that another Meteor was seen here last night nearly about the same time, and in a similar direction, as the meteor of the 19th ultimo. It was observed a quarter before seven o'clock, and was of a dark yellow color. When first seen it was just below Denebola in the Lion, and of course about due east from us; and having fallen through an arc of the heavens of 20° or 30°, disappeared at an altitude of 10° or 15°. Its apparent diameter was about the same as that of Venus at present. I would also remark that the meteor of the 19th ultimo started from near the same region of the heavens, (perhaps more to the north, in the vicinity of Bosenice's hair), and having fallen nearly perpendicularly towards the earth, burst at an altitude of 15° or 20°. Its light was a brilliant white silvery light, and its apparent diameter as observed here was two or three times that of Venus. I also observed three other meteors in the course of last evening—one about half past seven o'clock seemed to commence in the vicinity of the constellation Corvus, and after traversing an arc of 20° or more, disappeared in the vicinity of the large star in the southern part of the ship, about 20° west from the Southern Cross. Its motion was very slow, and it left a bright path behind it.

METEOR OF THE 13TH APRIL, 1849, OBSERVED AT HINGOLEE, POONA, AND BOMBAY.

LAST night as a friend and I were seated in a "Chubootarah," in front of my house, enjoying a refreshing zephyr that had just sprung up after a day of intense heat, and as I was contemplating the blue and spangled vault over our heads, my attention was attracted to a beautiful Meteor, to which I immediately drew my friend's attention. The time just as the evening gun had sullenly boomed at 9 P. M., and its echo had scarce finished reverberating among the adjacent hills when this body burst into view a little to the West and South, just as if the concussion had broken a portion from off one of the spheres above, and what we saw was the falling debris. From where we were seated the apparent nucleus whence it started seemed not to be more than 28 or 30 degrees in height from the to us then visible horizon. It left behind it a train of most beautiful light, and which appeared to us by no means inconsiderable in breadth—color that of a most beautiful "blue light." I am exceedingly curious to ascertain whether or not any such luminous body as the one in question, seen by us here on the aforementioned night, was visible elsewhere—you would have seen it had such been the case. The corusacation lasted for several seconds, when I lost sight of it behind my office bungalow. J. J. H.

Hingolee, April 14th, 1849.

☞ An account of a Meteor of the same description exactly, seen at Bombay at the same hour of the same evening, appeared in our last. If it was the same, it has travelled over nearly 300 miles of country from East to West.—EDITOR.

Sir,—On opening your paper of this morning I was astonished at not seeing any mention made of *another* very brilliant Meteor that burst last night. At about a quarter past nine o'clock last night, a light all of a sudden, as brilliant as that of the moon, shone for a second or two. Wondering from where this appeared, I looked round, and saw it just as it was dwindling away. The direction that it burst, was south-east. This is the *third* meteor seen within three months.

Bombay, 14th April, 1849. Z.

A Meteor of surpassing brilliancy was observed here on Friday evening 13th inst., at about three minutes to nine o'clock. Our informant was walking in a westerly direction, when the atmosphere, which had been somewhat dull and heavy, was suddenly illuminated by an intense light immediately behind him —turning instantly round he perceived it emanated from a brilliant meteor of a bluish color and about the size of an egg. It first appeared due east; and proceeded towards the horizon in a southern direction. It was in sight about three seconds, and was first seen at near 30° altitude, and became lost to view at about 8°.—Poona Chronicle, April 20.

METEOR OF 30TH APRIL, 1849, OBSERVED AT POONAH.

A POONAH correspondent gives us the following account of a Fireball seen by him on the 30th April, of which we have not hitherto seen any notice :—

POONA, *2nd May*, 1849.—You have not quite done with the meteor yet, as the following will show. On Monday, 30th April, at 7·7, a Meteor was seen just under β (Beta) Ursæ Minoris, descending obliquely to the left at an angle of about 55°. It disappeared at an altitude of about 6°, at which time its azimuth must have been N. 10° or 11° E. Its whole visible track did not exceed 7° or 8°, and it was brightest just before disappearing, but did not then exceed a star of 2nd magnitude. Its color was dusky red; duration perhaps 1½ seconds.—W. S. J.

Subjoined is an interesting notice of the Meteor mentioned in our last. May not the circumstance alluded to by our correspondent account for the showers of dust and ashes occasionally observed at such vast distances from volcanoes as to have proved subjects of much perplexity to those trying to explain them on the assumption of their being due to eruptions? The appearance of red snow, showers of blood, and the like, would be at once produced were iron reduced to peroxide by combustion to commingle with snow or rain during their fall.

"On Thursday evening at Malabar Point, half an hour after sunset, I observed a splendid Meteor about S. S. W. falling slowly on a plane inclined at an angle of 30° to the horizon (the acute angle being to the right.) Its angular velocity about 2° per second. Mean time of Observation 6·52½ P. M. It passed about 2° to the left of a star of the first magnitude (viz. Canopus, its true altitude being 6° 53′ and true bearing S. 27° 28′ W.) When first noticed it was a few degrees above the star, shining with a steady planetary light like Jupiter. When it had fallen to about the same altitude as the star, it blazed out with an intensely dazzling white light brighter than Venus; then quickly faded into a shower of what appeared dull reddish yellow sparks, and ended its course in a vertical direction, disappearing when about 2° above the horizon. If this was an extra terrestrial body, the direction of its motion in space showed as if it had overtaken the earth or its orbit. If the blazing out occurred when entering the atmosphere, its distance from Bombay must have been considerable (probably 150 miles,) and its size corresponding (perhaps thirty yards in diameter.) It would be interesting if simultaneous observations could determine the height of this blazing appearance that almost all Meteors have at some part of their course. I forget if Humboldt has anything conclusive on the subject. One remark, *not to be found in the Cosmos*, but nevertheless true, is, that if a 32lb. iron shot played the part of an aerolite, and entered the atmosphere with the velocity of ten miles per second (a moderate velocity for such bodies,) the heat generated by the resistance of the atmosphere would be sufficient to raise the temperature of the shot one million of degrees. Such an immense and sudden evolution of heat would probably not only melt the iron, but oxidize it with an exhibition of intense combustion, and the splendid meteor would finish its course by gently descending to the ground in the shape of an insignificant red powder. Has this been the fate of the young planet of the 19th March?"

The meteor was seen at Kandhalla a few minutes before seven o'clock, travelling from N. W. to S. E., and is described as having been of exceeding brilliancy.

METEOR OF 6TH MAY, 1849, OBSERVED AT KURRACHEE.

KURRACHEE, *May 7th*, 1849.—As you ask for notices regarding Meteors, here is one for you. Yesterday evening (May 6th) at 6·45, a Meteor fell here. When first observed, it was at an elevation of about 25° or 30°, and appeared to be falling from the zenith to a point of the horizon a little to the Eastward of North, where it vanished at an elevation of about 5° without any appearance of explosion, and I should say that it fell below my horizon in a perfect state. I cannot say that I saw it from the commencement of its course, as I was observing something else at the moment intently when it attracted my notice at the elevation above mentioned. It had the appearance of a clear ball of fire, with a slight green tinge, and was considerably larger than Venus when at her brightest. Had it occurred an hour later, it would have presented a splendid appearance, but as the sun had only just set, it was still broad daylight. The day had been hot and sultry, but at the time alluded to there was a cool breeze from the N. W., with a clear sky.

METEOR OF 25TH JUNE, 1849, OBSERVED AT KURRACHEE.

A CORRESPONDENT gives a somewhat more minute account of the Meteor seen through Lower Scinde on the 25th June than that extracted from the *Kurrachee Advertiser* in our last, or given from the same source in our present issue. It was observed by our friend about ten o'clock at night, just before it broke. It seemed to be proceeding from South to North, and appeared to explode about 60° above the horizon. It broke into a multitude of bright red fragments, which vanished from sight shortly after the explosion. About five minutes after this a report was heard, like that of a heavy piece of ordnance fired at a distance, and we have no doubt that this was the sound of the bursting meteor, the fragments of which may yet be found. W

hope our friends at Hydrabad and Sukkur will inform us whether it was seen by any of them. There were no stars visible in the direction of its path at the time when it was first seen, and no immediate means therefore of comparing it with any celestial object: so brilliant was it that it filled the room with light. The following is a list of the meteors for 1849, with the particulars of whose appearance we have been favoured:—24th February, Madras; 19th March, the great meteor seen off the sea coast of Goozerat, at Bombay, Khandalla, Poona, Ahmednuggur, Mundlaisir, Malligaum, Asserghur, Jaulnah, &c. &c.; 23rd March, Bombay and Khandalla; 4th April, Delhi; 10th April, Ahmednuggur—one large and two small meteors; 13th April, Bombay, Poona, and Hingolee; 30th April, Poona; 2nd May, Bombay; 6th May, Kurrachee; 25th June, Kurrachee. The meteors of the 19th March and 25th June are the only two that were heard to explode; there is every reason to believe that the former of these was burnt to ashes and fell to the ground in the shape of dust. The atmosphere all over the Saugor and Nurbudda Territories was throughout the last week of March so filled with fine dust that the sun could be looked at, especially at near noon, with the naked eye.—*Bombay Times.*

A most brilliant Meteor appeared about half-past nine o'clock on the night of the 25th instant. We did not ourselves see it, having been within doors, but the light thrown out was plainly perceptible for some five or six seconds. About fifty or sixty seconds after its disappearance, a report like that of a distant heavy gun was distinctly heard.—Kurrachee Advertiser, June 27.

METEOR OF 27TH JULY, 1849, OBSERVED AT POREBUNDER.

"POREBUNDER, 2nd August 1849.—On the night of the 27th of July, about half past 8 o'clock, a very bright meteor shot out from the Northern sky. When first seen, its elevation was about 70°, and it fell nearly perpendicularly. Its fall was not very rapid, it being distinctly visible for about five seconds when it burst, leaving a large train of bright red spots to mark its track. The light was so bright as to attract the attention of persons whose faces were towards the South. At the time of its appearance, the weather was calm and cloudy, a slight air now and then from the West, and scud flying rapidly from the same point. An hour afterwards heavy rain set in, which has continued almost without intermission ever since. The whole country in the neighbourhood is under water. Several houses have fallen down in the Town, but no serious injury has accrued therefrom. Such a quantity of rain has not fallen in the Zillah for the last five years."

METEOR OF 8TH NOVEMBER, 1849, OBSERVED AT BOMBAY.

A BEAUTIFUL Meteor was seen at half-past six on Thursday evening rushing from West nearly due East. As seen from the Esplanade, it appeared to disappear over Butcher's Island; it was in the Constellation of the Pleiades, then about 20° above the horizon. It was of a bright greenish white color—disc circular and perfectly well defined—about four times the size and brilliancy of the planet Venus when at its brightest. When near the end of its career, it threw out a mass of red fragments or sparks, and left a train of these behind it about 10° in length visible for three or four seconds after the disappearance of the Meteor itself, which seemed to vanish at once, without altering its form or size. The air at present is full of the smaller sized Meteors for which October and November are remarkable.—Bombay Times, November 10.

WE have to thank our friends for various notices of the Meteor mentioned in our last as seen at half-past six on the evening of Thursday the 8th inst. The descriptions given correspond so closely with that which has already appeared, that it seems superfluous to reprint them. About half-past nine the previous evening one of the most magnificent fire balls ever witnessed was observed rushing towards the East. Seen from Mazagon, it seemed to burst over Elephanta, and descend in a perfect stream of blazing fragments. All night long the air was filled with shooting stars of lesser magnitude, but after one such as that alluded to, they seemed scarcely worthy of attention.—Ibid, Nov. 14.

METEOR OF 12TH DECEMBER, 1849, OBSERVED NEAR SHORAPORE.

CAMP BOHNAL, NEAR SHORAPORE, 14*th December*.—You are desirous of intelligence of Meteors, and therefore I mention that the night before last, about half-past eleven (I had no watch with me,) I observed a very brilliant Meteor pass rapidly from the zenith, and fall in a south-west direction, exploding when within about 20° of the horizon, in a shower of brilliant sparks. I cannot speak accurately as to its size, which appeared to increase as it descended, but it was at least four times as large as Venus at her brightest, and gave out light enough to dim the light of the stars in the direction of which it passed. I have no doubt, if there had not been many torches burning near me at the time, that its light would have been strong on the ground. I could hear no noise on its explosion. The colour of the Meteor was a greenish white.

METEOR OF DECEMBER 1849, OBSERVED AT MALLIGAUM.

A brilliant Meteor was visible here last month. I am told it seemed to fall from a point about 60° above the horizon, and disappeared in some brushwood on the other side of the Girna. It was seen about 6 o'clock in the evening, and had a curious effect upon some of the horses in camp. There was no explosion. The present state of the atmosphere (a dry cold) is very favorable to the developement of electrical phenomena. This was strikingly displayed at the Band the other night, when a gentleman in taking off his hat to a lady, was observed to be surrounded by a 'Glory', which turned out to be caused by thousands of electrical sparks coming from his hair ! ! ! —Malligaum, 28th January.

METEOR OF 14TH JANUARY 1850, OBSERVED AT PENN AND BELLARY.

We return our best thanks to W. H. P. for the following account of a Meteor seen by him on Monday evening at Penn :—

TO THE EDITOR OF THE BOMBAY TIMES.

Sir,—I saw a beautiful Meteor this evening, about seven o'clock. It was of a dark red color, travelling in a North-Easterly direction, at a moderate rate, and close to the Earth. I do not remember ever to have seen a Meteor keep a course so steady, and for such a length of time, as the present. I had a view of our fiery-friend for several seconds, and only lost sight of it when the hills intervened. It had the appearance of a most determined star, and seemed bent upon going ahead, even at the risk of losing its meteoric character, and being taken for something more substantial. I wonder how long it kept the steam up !

Penn Jungles, 14th January, 1850. W. H. P.

Sir,—I beg leave to inform you that last evening about a quarter to seven o'clock, I was witness to one of the most brilliant Meteors that I have ever seen. It rose in the west, and proceeded directly over the whole heavens and set in the east. When it first was noticed by me it appeared about the size of a fourteen pound shot, with a short luminous tail, which I should think extended about 30 degrees. About an hour after this another, on a smaller scale, appeared towards the east, but on comparison it looked more like a shot star. The evening was very serene, with a small bank of clouds near the horizon towards the east.

Bellary, 15th January 1850. R. S.

☞ This, most probably, was the same as the meteor seen from Penn at the same hour, and travelling in the same direction. At Penn it seemed low in the heavens.—EDITOR.

METEOR OF 6TH FEBRUARY 1850, OBSERVED AT BOMBAY.

A splendid Meteor was seen from the Esplanade on the evening of Wednesday 6th February at about a quarter to seven. Its course lay nearly from north to south : it was, when first seen, about vertical. When about 40° above the horizon it burst and fell in three large pieces, which soon became invisible. An instant before explosion it seemed twice to change its aspect, becoming for a space partly luminous only, and then bright again :—it was pear-shaped, of a whitish colour, and nearly four times the size of the Planet *Venus*. We would strongly recommend parties observing meteors carefully to note their direction, their size as compared to some star, and above all, the precise instant of their appearance, and time of their remaining visible. The latter may be guessed at very nearly : it would be no great trouble to take out a watch and note the former.—*Bombay Times.*

METEORS OF 7TH AND 10TH FEBRUARY 1850, OBSERVED AT SEA.

"PALINURUS," AT SEA, FEBRUARY 21ST, 1850.—The following memo. of Meteors lately seen, I hope may prove interesting to you :—Feb. 7th, Latitude 24° 53′ N., Longitude 66° 16′ E., at 7 P. M., a large Meteor, about ½ the diameter of the Moon, appeared to the eastward, about 40° elevation, and vanished to the north-eastward, about 25° elevation. Weather somewhat hazy, with a cloudless sky, wind east, 3 ; barometer 30·01 ; thermometer, air, 74°, wet-bulb, 71°.—February 10th, Latitude 24° 18′ N., Longitude 66° 30′ E., at 8·30 P. M., a large Meteor, at least ½ the diameter of the Moon, appeared, elevated 8° S. S. W., and disappeared again instantly about 2° to the southward. This meteor displayed a most brilliant light, and had a clearly defined short

tail, not more than four times the diameter of its body in length. Weather very clear, and sky cloudless; wind W. S. W. 3 ; barometer 30·01 ; thermometer, air, 71½°, wet-bulb 69½°.

METEOR OF 8TH FEBRUARY 1850, OBSERVED AT BOMBAY.

At a quarter to seven P. M. on the 8th February while walking along by Chinchpoogly Hill, I saw a Meteor come in sight about 70° from the horizon. At its greatest it was about the size of Venus when full. It pursued a S. W. path for about 15°, and then all at once disappeared without exploding. It presented a faint red streak at first, then blazed out at once into a white flame as if blown into a state of ignition—presenting, in fact, an exact fac simile to a piece of slightly lighted combustible matter swung rapidly through the air till it first gets into a glow and then into a flame : and this is a very common appearance. Like the Meteor of the 5th, it seemed twice partially extinguished and then became bright again. There have of late been repeatedly seen shooting stars betwixt the pole and the N. W. horizon—they bear no resemblance, however, to common fire-balls. One leading point of distinction besides magnitude is, that the fire-ball continues from its first appearance till its extinction rapidly to encrease in brightness : the shooting star is nearly the same throughout.—G. B.

METEOR OF 26TH FEBRUARY 1850, OBSERVED AT VINGORLAH.

At 2 A. M. a magnificent Meteor was seen from Vingorlah : it seemed to descend almost perpendicularly from the zenith like a large bluelight. Seen from the town it appea red to fall to the S. E. right on amongst the shipping.—*Extract from a private letter.*

METEOR OF 4TH MARCH 1850, OBSERVED AT SURAT.

Surat, 7th March, 1850.—I send you the following, believing it will interest you. On Wednesday evening, at nine o'clock, a beautiful Meteor burst suddenly into sight in a quarter of the heavens to which my eye was at the instant directed, viz., R. A. 15°, N. P. D. 20° (very nearly.) It remained in sight but a moment, and was in brilliancy, size, and color, like Sirius ; and its appearance and disappearance were quite startling from their suddenness. It passed over about 5° of the heavens from E. to W., leaving behind it a train of dull red sparks of the same length,—strikingly resembling a comb, the teeth pointing downwards towards the horizon. The train descended very slowly, and the teeth, as it were, gradually shot out from each, and downwards, increasing in length as they approached the centre, until the train assumed the form of the Roman letter V, the angle being composed of large egg-shaped drops, like molten iron, and the intermediate space between the lines forming the letter, filled with parallel vertical lines of sparks. This appearance gradually faded from the sight, (without altering in shape)—very like the color disappearing from a piece of heated iron as it cools. It had descended about 5°, when it finally disappeared : it remained in sight full fifteen seconds—I counted fifteen slowly, and did not begin to count till a second or two after the app earance of the Meteor. If the accepted theory is correct, perhaps I shall not be wrong in assuming that the Meteor must have cut a chord of an arc through the verge of our atmosphere, the outer surface being fused and thrown off in its passage, the principal body continuing its course through space beyond the limits of the atmosphere,—the attraction of some other body acting more powerfully upon it than that of the earth, which, by the way, it is difficult to conceive.—Ursa Minor.

METEOR OF THE 18TH MARCH 1850, OBSERVED FROM THE "BERENICE" STEAMER BETWIXT DWARKA AND THE INDUS.

On the 18th March, at ten P. M., a fine Meteor was seen from the *Berenice* steamer betwixt Dwarka and the Indus. It was about the size of Jupiter, and seemed to descend from about 45° to 20° due south, when it suddenly disappeared without explosion or previous diminution of light. It appeared first as a red spark, encreasing in brightness as it rushed along like a burning streak swift through the air : about the middle of its course it flamed out into a brilliant white light, like the stars of a rocket. This continued to increase in brilliancy till it disappeared as it had been by instant extinction.

METEOR OF 29TH MARCH 1850, OBSERVED AT GOOLBURGAH.

A Meteor of moderate size burst at 8¼ P. M. on the 29th March, at 11° above the horizon, 79° W. from N.—Lat. of Goolburgah 17° 20′ N., Long. 76° 54′ E.

METEOR OF 10TH APRIL 1850, OBSERVED AT BOMBAY, SURAT, AND MALWA.

A Luminous Meteor of great beauty appeared in the Eastern sky on the evening of Wednesday 10th April. It was observed at twenty-five minutes to seven o'clock about 40° above the horizon, in the direction of the ghauts : it traversed a space of nearly twenty-five degrees towards the south, leaving behind it for nearly half its path a streak of red-coloured sparks,—and then disappeared with a faint red light. It was visible for about five seconds, and was equal in size to the planet Venus.

A Meteor about the size of Venus at her brightest was seen from the Agricultural Society's Gardens at 6 3¼ P. M., on the 10th April. It was unusually low—about 15° above the horizon, and seemed close at hand, not half a mile off. It swept along leisurely from nearly N. to S.; was white and lambent, and did not increase sensibly in size as it proceeded. After traversing about 10° it threw out a long train of red sparks, and at about 10° vanished at once. Its progress was slow, and its path seemed undulating. I have never before seen a Meteor so low, so near, or so unsteady in its movements.—G. B.

SURAT, 16TH APRIL.—A Meteor was seen here, on Wednesday evening last, which I think must have been the same as that noticed in your paper of the 13th. I had no means of noting the time, but it must have been about "twenty-five minutes to seven o'clock," and "it traversed a space of nearly twenty-five degrees towards the south," and appeared to explode nearly on our meridian (south.) Though there was a considerable quantity of sun light at the time, it was intensely brilliant, of a bluish color, and double the apparent diameter of Jupiter, which was visible at the same time. The greatest altitude of the meteor was not I think more than fifteen degrees; it left no train behind it, but, in appearance, it was like a comet with a short tail.

MEHIDPORE, 17TH APRIL, 1850.—The Meteor referred to in your issue of the 13th was visible in Malwa, though I think it must have been nearer 7 o'clock. The evening was rather dark, and I was driving homewards, when suddenly the road became brilliantly illuminated, and on turning my head in the direction from which the light came, I saw the Meteor, apparently descending in a curve from a little to the west of north towards the south-east. The train was luminous, and at the moment of the Meteor becoming extinct it appeared to burst like a rocket. I do not remember ever to have seen one so large or bright before.

METEOR OF 15TH APRIL 1850, OBSERVED NEAR SHORAPORE.

CAMP JEWRAJEE, 16TH APRIL, 1850.—I observed a very brilliant and beautiful Meteor last night about eleven o'clock, as well as I could judge by the stars,—I had no watch,—which passed rapidly from near Spica Virginis, where it appeared a little below it, and increasing in size as it moved, burst into a mass of sparks about the centre of the small triangle formed by ϵ and ζ Centauri and α Lupers. Its colour was a brilliant greenish yellow, and it seemed half as large again as Jupiter, or indeed double its size. There were some lighted torches about me, so that the light was not very observable, except in its path. The sparks descended gradually for a short distance, and then faded.

METEOR OF 2ND MAY 1850, OBSERVED AT BOMBAY.

A Meteor seen from near Byculah Church on the 2nd May seemed due east: first visible about 45°, it fell nearly 20° and then vanished without explosion. It was nearly pure white, increased in size as descended,—did not librate, and left no train behind it, and was at its brightest about the size of Jupiter.—G. B.

METEOR OF 10TH JUNE 1850, OBSERVED AT KISHNAGHUR.

To the Editor of the Morning Chronicle.

SIR,—As the phenomenon I am about to record was a most extraordinary one, I hope you may receive further notices of it. Last night I was sitting in the open air with two other gentlemen at about 12 or 13 minutes after 10 o'clock, when a most beautiful brilliant meteor appeared, which we all saw. It issued from the heavens near a star of second magnitude about midway between Scorpio and a planet to the West—its direction was very nearly from S. W. to N. E., it did not drop but shot rapidly across the heavens, appearing to increase in size and brightness, and after proceeding a considerable distance (gaining rather than losing its splendid brilliancy) it burst and numerous luminous particles were discharged from it. About ¼ of a minute after it had so disappeared, and while we were expressing our wonder and admiration, a distant though loud rumbling sound commenced and reminded us of regimental file firing. At first we thought it might be thunder, though there were very few clouds, and they were only near the horizon. The sound continued for certainly ½ a minute, and we had time to receive the impression that it followed in the track of the meteor, when the sky was perfectly clear and bright. It was also seen by natives and described exactly.

Kishnaghur, June 11, 1850. J. C. BROWN.

METEOR OF 1ST JULY 1850, OBSERVED AT BOMBAY.

On Monday evening, the 1st July, about half-past seven o'clock, a beautiful Meteor was seen to shoot across the sky from S. E. to N. W. for a distance of about 20°, when it exploded about 70° from the horizon, bursting with a bright flash into a number of pieces.

METEORS OF NOVEMBER 1843, OBSERVED AT THE COLABA OBSERVATORY.

8th November.—A meteor passed from south-west to south at 3·42 A. M. Bombay mean time.

9th November.—A meteor flashed from a little above the horizon towards west, at 12·39 P. M.

14th November.—A meteor flashed northward from below Zenith, at 0·52 A. M.

Ditto A meteor passed from little above the S. H. to the S. H. at 1·37 A. M. Bombay mean time.

Ditto A meteor passed by the Zenith from the N to southern horizon at 2·28 A. M.

Ditto A meteor passed far below Zenith, from the north to southern horizon.

Ditto A meteor passed a little below Zenith at 8·35 A. M. Another in the same direction at 8·41. Another a little below Zenith in the north-west at 8·46. Another in the Zenith at 8·49 P. M.

Ditto A meteor passed a little below Zenith towards south west at 11·27 P. M.

Ditto A meteor passed a little above the horison in the west at 11·55 P. M.

15th November.—A meteor passed from *a* Argus to the south-west at 1° 45′ 30″ A. M. Bombay mean time.

Ditto A meteor passed from (Canis) Sirius the Dogstar in δ Goris to the east at 1·57 A. M.

Ditto A meteor passed from afar below Zenith to the south at 10·22 P. M.

Ditto A meteor passed from a little above the horizon to the east at 10·26 P. M.

Ditto A meteor passed from a little above the horizon to the east at 10,33 P. M.

Ditto A meteor passed from a little above the horizon to the south at 10·45 P. M.

Ditto A meteor passed from a little above the horizon to the north at 10·55 P. M.

16th November.—A meteor passed from Orion towards the east at 0·24 A. M.

Ditto Another meteor passed from a little above the horizon to north-east at 0·37 A. M.

Ditto Another meteor passed from a little above the horizon towards east at 10·58 P. M.

Ditto Another meteor passed from a little above the horizon towards N. at 11·22 P. M.

Ditto Another meteor passed from a little below Zenith towards south-east at 11·37. P. M.

Ditto Another meteor passed from a little below Zenith towards south at 11·52 P. M.

17th November.—A meteor flashed in the north at 8·24 P. M. Bombay mean time.

Ditto A meteor passed from a little below Zenith towards the south at 10·7 P. M.

20th November.—A meteor passed from north-east to north at 8·33 P. M. Bombay meantime.

Ditto Another passed from south to south-east at 10·3 P. M.

METEORS OBSERVED AT THE COLABA OBSERVATORY IN 1844.

By. M. T.		Mag.	Dur.	Sec.
	THURSDAY, 31ST OCTOBER.			
2·37 A M	A meteor passed from the Zenith to the west.....			
8·42 P M	A meteor passed westward in the north.....	2		
	FRIDAY, 1ST NOVEMBER.			
4·39 A M	A meteor passed from below Zenith towards north...			
4·52 A M	Another was seen passing towards east.....			
	SATURDAY, 2ND NOVEMBER.			
10 45 A M	A meteor flashed in the Zenith towards north...			
10·52 P M	Another towards east.			
	SUNDAY, 3RD NOVEMBER.			
2·49 A M	A brilliant meteor passed from about 15° above the S H to it.	1		4
	MONDAY, 4TH NOVEMBER.			
3·52 A M	A small meteor passed to western horizon from little above it...	5		
4·41 A M	A small meteor passed by the constellation Ursa Majoris towards eastern horizon.....			
	TUESDAY, 5TH NOVEMBER.			
2·47 A M	A small meteor passed westward from the Zenith.....	6		
3·39 A M	A small meteor passed to the south horizon from a little above it.	2		
3·45 A M	A brilliant meteor passed to the western horizon from a little above it.	1		
7·46 P M	A meteor passed in the western direction from above the northern horizon.....	4		
	WEDNESDAY, 6TH NOVEMBER.			
9·35 P M	A meteor flashed in the north-east towards the north-east hor.	4		
	THURSDAY, 7TH NOVEMBER.			
7·56 P M	A meteor passed from the Zenith towards the south.....	4		
	FRIDAY, 8TH NOVEMBER.			
2·20 A M	A meteor passed southward...	2		
2 32 A M	A brilliant meteor passed northward from the Zenith....	1		
2· 7 A M	A small meteor passed westward.....	6		
2·57 30″ A M	A meteor passed southward from the Zenith...	3		
3·45 A M	A very brilliant meteor passed rapidly from the east of Zenith to south.....	1		3
4·46 A M	A meteor passed eastward from a little above the northern hor...			
10·49 P M	A meteor in the north passed towards the north hor.....	3		

By. M. T.		Mag.	Dur. Sec.
10·57 P M	Another in the northeast of the 3d magnitude, two others in the constellation Orionis, one of the 5th magnitude and the other of the 3d magnitude, which was a shooting one.....		
11·22 P M	A meteor in the Zenith of the 6th magnitude. Another near Geminii in the northeast at 11·51.....	3	
	SATURDAY, 9TH NOVEMBER.		
2·56 A M	A small meteor passed from Pleiades to the north.....	6	
4·22 A M	A meteor passed from the Zenith to the south.....	3	
4·24 A M	A brilliant meteor passed westward from a little above the pole-star..	1	3
11·41 P M	A meteor in the north-east	4	
11·55 P M	Another in the northeast.....	5	
	SUNDAY, 10TH NOVEMBER.		
0·23 A M	A meteor passed northward from the Zenith...	3	
1·27 A M	A meteor passed to the southern horizon from a little above it...	3	
1·40 A M	A small meteor passed to the western hor. from a little above it.	5	
2·22 A M	A brilliant meteor passed from the west of α Orionis to south west...	1	2
2·41 A M	Three meteors passed from the north of the Zenith, one to the west, 2d to the south, and the 3d to the north...	6	
2·47 A M	Four or five meteors were observed going to and fro, in the Zenith.....	6	
3·27 A M	A meteor rapidly passed from far below the Zenith to north-east.....	1	
3·42 A M	A meteor followed by another small meteor passed eastward from the Zenith....	1 & 6	
3·47 A M	A very brilliant meteor passed from Ursa Majoris to the N.....	1	1
3·59 A M	A meteor passed from a little above the west horizon, to north-west...	2	
4·46 A M	A meteor passed from above the horizon to west.....	4	
7·40 P M	A meteor passed from a little below the Zenith to south.....	3	
7·57 P M	A meteor passed from a little above the north pole-star towards the horizon.	3	
8·27 P M	A very small meteor passed from north towards west.	5	
8·38 P M	A small meteor from a little below the Zenith passed towards the north.....	4	
9·27 P M	A meteor passed from the Zenith towards west.....	4	
9·32 P M	A meteor passed from north to northeast.....	3	
	MONDAY, 11TH NOVEMBER.		
1·20 A M	A meteor passed eastward from the Zenith...	3	
1·25 A M	A small meteor passed westward from a little below the Zenith...	5	
1·39 A M	A small meteor passed north eastward from Ursa Majoris.....	6	
1·47 A M	A meteor passed by the east of Ursa Majoris to the eastern hor.	2	
2·50 A M	A meteor passed from a little above the southern horizon to the east.	2	
2·57 A M	A brilliant meteor passed eastward from (Sirius) dogstar to (Gal) milkyway.....	1	1
3·26 A M	A brilliant meteor passed by the east of Ursa Majoris to the northeast horizon...	1	
3·39 A M	A meteor passed rapidly by the west of pole-star to the north.	1	
3·45 A M	A small meteor darted westward from the Zenith.....	6	1
3·46 A M	A smaller one passed towards the north.....	6	
3·55 A M	A meteor made its appearance near the Zenith, and was lost near Ursa Majoris.	3	1½
4·42 A M	A meteor from below the Zenith passed towards the northern horizon.....	4	
7·50 P M	A small meteor made its appearance in the north very near the Zenith and was lost.....	4	
11·25 P M	Two meteors flashed along the Zenith. Mag. of the one 5th, and the other 6th...	5 & 6	
11·36 P M	A meteor in the east passed southward...	5	
11·53 P M	A meteor in the northeast passed towards the horizon.....	5	
	TUESDAY, 12TH NOVEMBER.		
1·37 A M	Two small meteors were observed in the milkyway, one passing to the east and the other to the west...	6	
1·42 A M	A meteor near α Orionis, passed eastward from the milkyway....	3	
1·51 A M	A brilliant meteor passed from a little above the pole-star to the northern horizon...	1	
2·03 A M	A small meteor passed eastward from a little below the Zenith...	5	
2·37 A M	Three small meteors, at the interval of 2 minutes, were seen in the milkyway east of Zenith...	6	
2·47 A M	A meteor passed rapidly from the east of the Zenith to it.....	3	
2·48 A M	A brilliant one passed from (Aldebaram) towards the west.....	1	
3·20 A M	A brilliant meteor passed northward from (Ursæ Majoris).....	1	
3·38 A M	A meteor passed northward from a little above the pole-star.....	1	

Bv. M. T.		Mag.	Dur.	Sec.
4·34 A M	A meteor passed from the Zenith towards the east, and another from below Zenith towards the eastern horizon...			
7·52 P M	Two meteors successively passed, one from above the horizon westward, and another towards the south.....	3 & 4		
10·44 P M	A small meteor in the northeast by east a little below the Zenith.	5		
10·56 P M	Another in the northeast a little below the Zenith...	5		
11·29 P M	A meteor in the northeast a little below the Zenith...	4		
	WEDNESDAY 13TH NOVEMBER.			
1·27 A M	A brilliant meteor passed from Canis Minoris to the southwest.	1		
1·42 A M	A very brilliant meteor passed from a little above Ursa Majoris to the west.....	1	1	
1·57 A M	A meteor passed from Cassiopea to the west...	3		
2·02 A M	A small meteor flashed near Cassiopea...	5		
2·20 A M	A brilliant meteor passed from the east of Ursa Majoris, to northeast.....	1	½	
2·20 30″ A M	A smaller one passed from a little below (α Eridani) to the southern horizon.....	3		
2·26 A M	A small meteor passed from (β Arietis) to the west...	2		
2·37 A M	A meteor passed from β Cassiopea) to the north...	2		
2·46 A M	A meteor passed westward from Arietis...	2		
2·49 A M	A brilliant meteor appeared a little below Canis Minoris and was lost near Castor...			
3·00 A M	A meteor appeared near (Auriqua) and was lost near Pollux.....	1		
3·30 A M	A meteor passed southward from the east of Canis Majoris.....	1		
3·45 A M	A small meteor flashed in the milkyway a little above the southern horizon.....	5		
3·49 A M	A meteor flashed towards the east of the Zenith.....	5		
3·55 A M	A meteor passed southward from Canis Majoris.....	1		
3·59 A M	A meteor passed in the direction of the north to south in the E..	1		
4·20 A M	A meteor passed from east towards Ursa Majoris.....	3		
7·56 P M	A meteor passed from below the Zenith to southern horizon.....	3		
10·03 P M	A small meteor passed from a little below the Zenith towards the horizon...	6		
11·17 P M	Another in the north east...	7		
0·22 A M	A brilliant meteor passed from the Zenith towards west.....	2		
	THURSDAY, 14TH NOVEMBER.			
0·35 A M	A meteor passed from a little below the Zenith, eastward.....	1	1	
0·48 A M	A meteor passed from below the Zenith to east.....	3	½	
0·55 A M	A brilliant meteor passed from below the Zenith towards west.	3	1	
1·32 A M	A meteor passed from a little below the Zenith to the north.....	3		
1·15 A M	A meteor passed along Aldebaram towards the eastern hor.....	2		
1·50 A M	A meteor from Ursa Majoris, passed to the northern horizon....	3		
2·00 A M	A meteor in the north passed towards the horizon...	3		
2·25 A M	A meteor from Aldebaram passed to the east horizon.....	4		
2·47 A M	A meteor in the north passed towards Ursa Majoris.....	3		
2·55 A M	A meteor passed from Aldebaram to east...	3		
3·25 A M	A meteor passed from (Pleiades) towards west...	3		
3·33 A M	A meteor in the north passed towards (Pleiades) in a westerly direction.....	4		
3·54 A M	Three meteors successively passed in the north, one along (Aqulie,) another towards (Ursa Majoris,) and the third towards the horizon...	1, 2, & 3		
7·55 P M	A meteor passed towards the eastern horizon...	2		
	FRIDAY, 15TH NOVEMBER.			
1·28 A M	A small meteor passed from α Ursa Majoris, to the north.....	6		
1·40 A M	A meteor flashed between Aldebaram and α Orionis...	2		
1·57 A M	A meteor passed to (α Ursa Majoris,) from a little above it.....	2		
2·15 A M	A meteor flashed southward in the milkyway...	5		
2·36 A M	A meteor flashed in the milkyway.....	4		
2·57 A M	A meteor passed to (α Ursa Majoris) from a little above it.....	1		
3·25 A M	A very brilliant meteor passed westward from (α Ursa Majoris) —its trace of light was visible for a second...	1	2½	
3·37 A M	A small meteor passed westward by the southern side of Cassiopea...	6		
3·46 A M	A brilliant meteor appeared near the milkyway, and was lost near (α Eridani)...	1		
3·47 A M	Two smaller meteors appeared in the western side of the milky way, and were lost near the south horizon.....	3		
3·48 A M	A brilliant meteor passed southward from the east.....	1		
4·42 A M	A meteor in the east passed towards the horizon...	2		
	SATURDAY, 16TH NOVEMBER.			
0·17 A M	A meteor flashed in the south.....			

By. M. T.		Mag.	Dur. Sec.
0·57 A M	A meteor flashed in the west...	5	
1·32 A M	A meteor passed from a little below (Castor) to the north.....	3	
1·41 A M	A brilliant meteor passed from a little above the S W II to it....	1	
1·46 A M	A small meteor passed southward from β Orionis.....	6	
1·57 A M	A very brilliant meteor passed from the east to the north..... ..	1	2
3·19 A M	A brilliant meteor passed from a little above the southern H to it...	1	
3·31 A M	A meteor passed westward from (α Arietis).....	1	
3·46 A M	A very brilliant meteor passed from a little below (α Aurigæ) towards the south...	1	1½
4·42 A M	A small meteor passed from eastward from (Ursa Majoris).....	3	
	SUNDAY, 17TH NOVEMBER.		
3·25 A M	A meteor passed to the northwest from a little below Canis Majoris...	2	
3·32 A M	A meteor passed to the northern horizon from β Ursa Minoris.	3	•
3·46 A M	A meteor passed northward from β Ursa Majoris.....	1	
3·47 A M	Two meteors passed to eastern horizon from the northern side of the planet Venus.....	1	
4·39 A M	A meteor passed westward from the east.....	3	
4·45 A M	A meteor from below the Zenith passed to the east.....	3	
8·10 A M	A meteor from the east passed towards the south east horizon...	3	
8·13 A M	Another from the north east passed towards that from Aldebaran	3	
	MONDAY, 18TH NOVEMBER.		
2·38 A M	A meteor passed eastward from Canis Minoris.....	1	
2·57 A M	A meteor passed to the southern horizon from the eastern side of (α Eridani).....	3	
4·17 A M	A meteor dropped down perpendicularly from Orionis.....	1	1
4·39 A M	A meteor flashed near the Zenith.....	3	
4·42 A M	A meteor from a little below the Zenith passed towards the east.	2	1
5·03 A M	A meteor passed from Venus towards the east horizon...	1	
9·04 P M	A brilliant meteor passed westward from Cassiopea.....	1	2
	TUESDAY, 19TH NOVEMBER.		
2·27 A M	A meteor from a little below the Zenith passed towards the S...	2	½
2·47 A M	A meteor in the south passed towards the (Canis Majoris).....	2	½
2·55 A M	A brilliant meteor from a little (Canis Majoris) passed towards the southern horizon...	1	½
3·47 A M	A meteor in the south dropped down towards the horizon.....	2	½
	WEDNESDAY, 20TH NOVEMBER.		
2·35 A M	A very brilliant meteor passed rapidly from a little above it to the north eastern horizon.....	1	
2·51 A M	A meteor flashed a little above Ursa Majoris...	3	
2·57 A M	A meteor passed eastward from a little below (Canis Minoris) and leaving sparks behind during its progress for half second...	2	
3·45 A M	A small meteor descended from the Zenith westward.....	5	
4·02 A M	A meteor passed westward from (α Eridani).....	3	
	THURSDAY, 21ST NOVEMBER.		
10·00 P M	A brilliant meteor descended from α Orionis to the south with a little inclination to the west...	1	
2·21 A M	A meteor flashed in the east...	1	
4·04 A M	A meteor flashed in the south...	2	
7·57 P M	A brilliant meteor passed from (Pleiades) towards the Zenith...	1	
	FRIDAY, 22ND NOVEMBER.		
1·30 A M	A large meteor descended to the eastern horizon from a little above it.....	1	3
	SATURDAY, 23D NOVEMBER.		
3·42 A M	A meteor passed to α Ursa Minoris from the northwest.....	2	
4·57 A M	A meteor passed from Ursa Majoris towards the east.....	2	
5·03 A M	A meteor passed from (Pleiades) towards the western horizon...	3	
	SUNDAY, 24TH NOVEMBER.		
3·52 A M	A meteor flashed in the north near Ursa Minoris...		
	MONDAY, 25TH NOVEMBER.		
4·34 A M	A meteor passed from the south towards (Pleiades).....	2	
4·47 A M	A meteor from south east passed towards Venus...	2	
4·55 A M	A meteor from a little below the Zenith, passed towards the east.	2	

By. M. T.		Mag.	Dur.	Sec.
	WEDNESDAY, 27TH NOVEMBER.			
4·48 A M	A meteor flashed in the south.....			
	THURSDAY, 28TH NOVEMBER.			
7·00 P M	A meteor in the west passed towards the horizon...	1		
	SUNDAY, 1ST DECEMBER.			
8·10 P M	A brilliant meteor in the north east passed towards the horizon...	1		
	THURSDAY, 5TH DECEMBER.			
10·42 P M	A meteor in the east...			
	MONDAY, 9TH DECEMBER.			
0·22 A M	A very brilliant meteor in the south passed towards the horizon.			
	TUESDAY, 10TH DECEMBER.			
7·55 P M	A very brilliant meteor passed from near α Arietis to the west, with a little inclination to the south.....	0	5	
	TUESDAY, 14TH JANUARY 1845.			
3·0¾ A M	A very brilliant meteor passed from the south towards the Zenith.....			

OBSERVATIONS OF METEORS AS TAKEN ON SEERAH ISLAND, ADEN, DURING THE MONTH OF NOV., 1848.

Date.	Aden meantime.	Magnitude as compared with the stars.	From.	To	Time of flight.	Remarks.
					″ ‴	
1	8·15	1	α Aquilæ Altari	α Cygni	1·2	Very bright.
1	10·19	3	β Aquarii	in a S W direction	0·7	
4	7·04	2	Zenith	in a N E direction	1·0	
4	8·24	1	About 6° above Polaris	Towards N W horizon	0·6	
4	10·35	4	α Persei	to N horizon	1·0	
5	9·40	4	α Ceti	S of Orionis	1·3	Leaving a trail of
7	8·00	2	10° S of Pledus	E horizon	0·7	[light for 3″
7	8·45	3	N W of Zenith	towards N W horizon	0·6	
7	9·00	4	N W by W Alt 45°	N W horizon	0·4	
7	9·16	2	Aldebaram	α Orionis	0·6	Comet-like tail.
7	9·35	1	α Cassiopeæ	W of Polaris	1·0	
7	10·11	5	β Orionis	S E direction	0·4	
7	12·04	3	Canopus	S W	0·6	
8	9·35	4	β Andromedæ	ν Andromedæ or Alamak	0·2	
11	6·54	1	5° above Altari	W horizon	1·0	Followed by a small
13	8·04	4	S E Alt 25°	S E horizon	0·3	[one.
13	8·54	5	S Alt 45°	S horizon	0·2	
13	9·56	3	β Cassiopea	N horizon	0·4	
16	7·20	1	15° above Polaris	N W horizon	0·7	Leaving a train of
16	7·23	4	A little above Polaris	N W direction	0·3	light visible 6″
16	7·30	1	About 4° above Polaris	N W horizon	0·6	
16	8·10	4	S 20° in Alt	S W horizon	0·3	
16	9·40	3	Belt of Orionis	E horizon	0·2	
16	13·15	3	W Alt 45°	W horizon	0·5	
18	9·33	1	W of Zenith	towards W horizon	0·7	[light.
20	7·20	1	S of Zenith	S W horizon	0·5	Leaving a train of
20	8·30	1	β Ceti	η Erdina	1·2	Very bright.
21	7·40	3	E of Pleiades	towards E horizon	0·6	
21	8·20	2	E of Zenith	α Orionis	1·0	
21	12·15	1	Above Polaris	N W horizon	0·7	
21	15·00	3	E of Jupiter	E horizon	1·0	
23	7·05	1	α Aquarii	α Gruis	0·5	
23	8·04	2	Zenith	Altor	0·4	
24	8·10	1	Zenith	W	1·2	
26	8·35	2	E of Zenith	E horizon	1·0	
26	9·16	2	Belt of Orionis	N E horizon	0·5	
29	9·30	2	Seeris	S horizon	0·7	

OBSERVATIONS OF METEORS TAKEN ON SEERAH ISLAND, ADEN, IN THE MONTH OF AUGUST, 1849.

Date.	Time.	Magnitude compared with the stars.	From.	To	Time of flight.	Remarks.
					" "'	
7	8·20	2	Alt 75° N W	15° of horizon in W	1·2	Leaving a bluish train
8	7·30	1	S of Z 10°	S W	0·7	Very bright. [of light.
8	8·16	3	*a* Scorpii	*a* Trianguli Australis	0·6	
10	9·30	2	N E of Z	15° of E horizon	1·0	
10	10·45	4	S E	towards S	0·5	Faint.
12	7·30	2	S W	S W horizon	1·2	Followed by a small one
12	8·05	3	Z	S W 45°	0·5	[about 5th Mag.
12	9·30	1	N E Alt 65°	towards N horizon	1·3	Very bright.
14	6·50	2	S of Z 15°	25° of S W	1·0	
14	10·05	3	S of Z 20°	towards S horizon	0·7	
15	8·45	4	Z	25° S W	0·3	
15	9·30	2	S W 15° of N	W	0·8	Leaving a reddish train
15	9·47	3	S W of Z	S W 45°	0·5	[for 1' 5"
15	12·05	2	E of Z	towards S 54°	1·2	Very bright.
15	2·06	1	5° S E of Saturn	15° of S W	1·3	Very bright.
18	8·15	3	S Alt 50°	towards S W	0·7	
19	7·45	2	5° N W of Z	Alt 40° W	0·8	
19	7·54	4	25° N W of Z	towards W horizon	0·5	Very faint.
22	6·30	3	25° N of Z	towards S W	0·6	
22	8·36	4	S of Z	about 2 ° S	0·4	
22	10·14	4	S of Z 15°	30° S W	0·5	
24	8·56	3	N W Alt 60°	towards N horizon	0·7	
25	11·15	1	Zenith	W by N		

OBSERVATIONS OF METEORS TAKEN ON SEERAH ISLAND, ADEN, DURING THE MONTH OF NOV., 1849.

					" "'	
5	8·09	3	Fomalhaut	to S horizon	1·5	
5	8·35	1	W of Algenob	*a* Cassiopea	2·0	Leaving a bluish train
5	9·04	2	Zenith	N E 25°	1·0	[of light.
5	10·10	3	15° E of Zenith	N E	0·5	
5	10·11	3	ν Ceti	*a* Arietis	0·7	
8	12·15	1	between *a* Tauri (Aldeb) and Zenith Rigel	35° N E	1·7	Very bright.
8	14·05	2	*a* Orionis	to N E	0·5	
10	9·02	3	25° N of Zenith	to Polaris	0·7	
10	9·31	4	40° W of Zenith	W horizon	0·5	
10	9·35	3	*a* Tauri	N horizon	0·7	
10	10·15	1	*a* Tauri	*a* Orionis	1·0	
13	7·30	1	E of Zenith	N E horizon	1·5	Very bright.
13	7·46	3	E of *a* Andromedæ	to N E horizon	0·7	
13	8·55	2	β Ceti	20° in S W direction	1·0	
14	9·25	1	*a* Tauri	N E horizon	1·3	Followed by 3 small
14	10·08	3	20° S of Zenith	S W direction	0·5	ones within 2 mi-
14	10·28	2	S E of Zenith	for 20° in S W direction	0·7	nutes.
19	10·05	1	Zenith	S E 30°	1·4	Very bright.

1.—*On the Meteoric Showers of November* 1836.—By Denison Olmsted, Professor of Natural Philosophy and Astronomy in Yale College.*a*

For six years in succession, there has been observed, on or about the 13th of November of each year, a remarkable exhibition of *shooting stars*, which has received the name of the "Meteoric Shower."

In 1831 the phenomenon was observed in the State of Ohio,*b* and in the Mediterranean, off the coast of Spain.*c* In 1832, the shower appeared in a more imposing form, and was seen at Mocha, in Arabia;*d* in the middle of the Atlantic Ocean;*e* and near Orenburg, in Russia;*f* and at Pernambuco, in South America.*g* The magnificent meteoric shower of 1833, is too well known

a Silliman's Journal, vol. xxxi. p. 386
b Amer. Journal of Science, vol. xxviii. p. 419.
c Bibliotheque Universelle, Sept. 1835.
d Amer. Journal xxvi. p. 136.
e Edin. New Phil. Journ. July 1836.
f Ibid, 349
g New York American, November 15, 1836.

to require the recital of any particulars. Of the recurrence of the phenomenon at the corresponding period in 1834, and in 1835, evidence has been presented to the public in previous numbers of this Journal. (See vols. xxvii. pp. 339, and 417; xxix. 168). I now feel authorized to assert, that *the meteoric shower reappeared on the morning of the 13th November 1836.*

It has been supposed by some, that the appearance of an extraordinary number of shooting stars, at several anniversaries since the great phenomenon of November 1833, can be accounted for by the fact, that so general an expectation of such an event has been excited, and that so many persons have been on the watch for it. Having, however, been much in the habit of observing phenomena of this kind, I can truly say, that those exhibitions of shooting stars which have for several years occurred on the 13th or 14th of November, are characterized by several peculiarities which clearly distinguish them from ordinary shooting stars. Such peculiarities are the following:

1. The *number of meteors*, though exceedingly variable, is much greater than usual, especially of the larger and brighter kind.

2. An uncommonly large proportion leave *luminous* trains.

3. The meteors, with few exceptions, all appear to *proceed from a common centre*, the position of which has been uniformly in nearly the same point in the heavens, viz. in some part of the constellation Leo.

4. The principal exhibition has at all times, and at all places, occurred between midnight and sunrise, and the *maximum from three* to four o'clock.

In all these particulars, the meteoric showers of 1834, 5 and 6, have resembled that of 1833; while no person, so far as I have heard, has observed the same combination of circumstances on any other occasion within the same period. I have not supposed it necessary, in order to establish the identity of these later meteoric showers with that of 1833, that they should be of the same magnitude with that. A small eclipse I have considered a phenomenon of the same kind, with a large one; and conformably to this analogy, I have regarded an eclipse of the sun, first exhibiting itself as a slight indentation of the solar limb, but increasing in magnitude at every recurrence, until it becomes total, and afterwards, at each return, but partially covering the solar disk, until the moon passes quite clear of the sun,—as affording no bad illustration of what probably takes place in regard to these meteoric showers. The fact, that the Aurora Borealis appears unusually frequent and magnificent for a few successive years, and then for a long time is scarcely seen at all, was proved by Mairan a hundred years ago.[h] There is much reason to suspect a like periodical character in the phenomenon in question, which first arrested attention in 1831, became more remarkable in 1832, arrived at its maximum in 1833, and has since grown less and less at each annual return. Some seem to suppose, that we are now warranted in expecting a similar exhibition of meteors on the morning of every future anniversary; and this, I think, is not to be expected. It is perhaps more probable, that its recurrence, unless in a very diminished degree, will scarcely be witnessed again by the present generation. The shower, however, at its late return, was more striking than I had anticipated; and it must be acknowledged, to be adventurous, to enter the region of predication respecting the future exhibitions of a phenomenon, both whose origin and whose laws we so imperfectly understand.

Accounts of observations before us show, that the meteoric shower was seen in most of the Atlantic States, from Maine to South Carolina.

From these accounts compared, we are led to conclude that the meteoric shower increased in intensity from north to south, that of South Carolina having been the most considerable of all, so far accounts have reached us.

Does not the recurrence of this phenomenon for six successive years, at the *same period of the year*, plainly show its connection with the progress of the earth in its orbit? and does not the fact, that the greatest display occurs every where in places differing widely in longitude at the *same hour of the day*, as plainly indicate its connection with the motion of the earth on its axis? The supposition of a body in space consisting of an immense collection of meteors stretching across the earth's orbit obliquely, so that the earth passes under it in its annual progress, while places on its surface lying westward of each other are successively brought, by the diurnal revolution, to the point of nearest approach, will satisfy both these conditions. I can think of no other that will. The "point of nearest approach" may be merely the extremity, or the *skirt* of the nebulous body: while the greatest part of it, and consequently, its centre of gravity, lies too distant from the earth to be much influenced by its gravity. It would not be at all inconsistent with the known extent of astronomical bodies, to give to the body in question a breadth of thousands, and a length of millions of miles. It was an accidental observation, made after the conclusion was formed, which ascribes the origin of meteoric showers to a revolving nebulous body, that first led me to suspect the *zodiacal light* to be the body in question. This according to Laplace, *is* such a nebulous body, revolving round the sun in the plane of the solar equator.[i]

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[h] Traité Phys. et Hist. de l'Aurore Boreale. Par. M. de Mairan. Memoirs of the Royal Academy of Sciences for 1731.

[i] Mec. Celeste Bowditch, vol. ii. 525.

We actually observe it to reach over the orbit of the earth, making an angle with its plane of only seven and a quarter degrees. It is not difficult to place it in such a situation, that the earth shall come very near to the *skirts* of it at least. We should, indeed, expect this meeting of the two bodies to take place at the nodes of the solar equator and therefore in December and June instead of November and April. It is easily conceivable, however, that the aphelion of the zodiacal light, at which place it approaches nearest to the earth, does not lie exactly at the node, but so far from it that the earth passes it a month before it comes to its node, at which time, moreover, the earth is more than a million of miles nearer to the sun than its mean distance. In endeavouring to fix the *periodic time* of the meteoric body, since it must be either a year or half a year (for no other periodic time could bring the two bodies together at intervals of a year *j*), several considerations induced the belief, that *half a year* was the true period, an inference drawn especially from the apparent great excess of velocity of the earth at the point of concourse; but the period of *a year* (or, more probably, a little less than a year,) by implying that the two bodies are always comparatively near to each other, would better explain the occurrence of shooting stars at all seasons of the year, and would be particularly favourable to the explanation of those meteoric showers which have on two occasions at least, *k* occurred near the last of April, a time distant about half a year from November, and therefore sustaining a like relation to the opposite point of its orbit. In such a case, meteoric showers would occur in April and November, for the same reason that the transits of Mercury take place in May and November exclusively. The greater frequency of meteors in November than in April, naturally results from the greater proximity of the earth to the sun at the former than at the latter period; to which, perhaps, may be added the effect of the eccentricity of the orbit of the meteoric body, the aphelion being on the side of Nov. In the present state of our knowledge on this subject, I regard it as a point open for inquiry, whether it will best accord with all the phenomena of shooting stars, to give to the meteoric body a period of nearly one year, or of half a year.

I have been somewhat disappointed that the astronomers should have paid so little attention to the remarkable changes which take place in the zodiacal light about the 13th of November, as has been repeatedly mentioned in this Journal. It appears to me a fact deserving their attention, that the zodiacal light, which for weeks before the 13th of November appears in the morning sky, with a western elongation of from 60 to 90 degrees from the sun (while up to that time not a glimpse of it can be caught in the evening sky), should immediately afterwards appear after the evening twilight in the west, and rapidly rise through the constellations, Capricornus and Aquarius, to an elongation of more than 90 degrees eastward of the sun, while it as rapidly withdraws itself from the morning sky, and within a few days vanishes entirely from the western side of the sun. For three years past I have observed these changes with much interest, and feel warranted in asserting that they have been repeated with uniform regularity. The present year the light was very feeble in the morning sky, an effect partly owing to the presence and peculiar splendour of the planet Venus; but as soon after the 13th of November as the absence of the moon would permit observations, the light appeared in the west immediately after twilight, crossing the Milky Way, and rising in a pyramid almost as bright as that, the triangular space between it and the Galaxy, embracing the Dolphin, appearing by contrast strikingly darker.

I can account for this great and rapid change of place in the zodiacal light, a change which is unlike any it sustains at any other period of the year, only by supposing that on or about the 13th of November it comes very near to us, and that we pass rapidly by it, thus giving it a great parallactic motion, an effect which is in perfect accordance with all our previous conclusions.

According to this view of the subject, *the zodiacal light would no longer be regarded as a portion of the sun's atmosphere, but as a nebulous or cometary body, revolving round the sun within the earth's orbit, nearly in the plane of the solar equator, approaching at times very near to the earth, and having a periodic time of either one year, or half a year, nearly.*

Such, I affirm, would be the fact should the zodiacal light be proved to be the body which affords the meteoric showers.—*Edinburgh New Phil. Journal for July—October* 1837.

2.—*Notice respecting the Periodic Meteors of the 13th of November.*—*By* M. L. F. Wartmann. *l*

A Cosmological phenomenon of the most interesting kind, although now as yet in the records of science, is at present attracting the attention of astronomers, meteorologists, and physicists. The magnificent assemblage of luminous points and globes which has been seen for several years presents a highly important subject of inquiry, by which we may be enabled to add to the stock of our knowledge respecting the constitution of our planetary system.

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j See vol. xxvi. p. 166, of this Journal.

k In Virginia, and various others parts of the United States, in 1803, and in France in 1095, making suitable allowances for the more rapid progress of the earth through the winter signs, and for the change of style, and the meteoric shower of the 20th of April 1095, occurred at very nearly the opposite point of the earth's orbit.

l From the *Bibliotheque Universelle*, N. S. 2 de Ann. No. 18, June 1837; having been read before the Society of Physics and Natural History of Geneva, December 15, 1836.

The appeal made upon this occasion by M. Arago spread far and wide, and this very year [1836] numerous observations, made in different places, have been sent to the illustrious philosopher who had asked for them. They concur in showing that, towards a point of the heavens at a small distance from the stars β and γ in the constellation Leo, a considerable quantity of shooting stars seem to be produced, and to succeed one another at short intervals, precisely in the place where a prodigious number of them had already been seen at Geneva in 1832, and especially in the United States in 1833. What is the nature of these fugitive stars? Whence do they come? Whither do they go when they disappear from our sight? Do they sometimes fall upon the earth? Such are the principal questions which every one asks himself, and which are of the highest interest.

The much-wished-for fall of one of these meteors would without doubt furnish the chemist and physicist with the means of explaining certain points quite unknown. Those observers also, who were aware of the importance of this enquiry, have not neglected to bestow their attention in this direction, and some of them, in fact, state that they have seen several of these meteors which were projected against the sides of the mountains by which they were surrounded. This fact is undoubtedly of a positive nature, but it is such as to prove the authenticity of the fall of the meteor down to the surface of the earth? Have not the illusions which exercise so great an influence here, and under which observers are more or less placed, contributed to a belief in a projection towards the ground which was apparent only? In support of this suspicion I may be allowed to mention a fact which I had an opportunity of stating more than six years ago in the former series of the Journal of Geneva, in the numbers for March and April, 1830, as follows: A meteor appeared on the 19th of March of the before-mentioned year, at half-past seven in the evening; according to the report of eye-witnesses, it had a round disc, with a well-defined edge, which was, almost equal to that of the full moon, and which shed a strong light of a bluish colour; it circulated with great velocity from east to west, and appeared to be at a very great height. Those who observed it at Geneva, and who followed it with their eyes in its horizontal course, thought they saw it burst in the air, and fall in pieces at some paces before them. Other persons, living at the village of Chene, half a league from Geneva, and who were by chance in the street, being convinced that they had seen it fall on a neighbouring house, ran directly to ascertain whether the building had not been set on fire. The same meteor was also remarked at Saint-Legier, near Vevey, in the canton of Vaud, and on the heights of Fraubrunnen in the canton of Berne. Those who saw it from this last place, and who followed it for about thirty seconds, agree in saying that it travelled slowly in the direction of the Jura, and that it appeared to them to fall not far from the neighbourhood of Orbe, a small town of the canton of Vaud, thirteen leagues north-east of Geneva. Thus in the three situations, the illusion of the observers was so complete, that in spite of the distance which separated them, namely, in the one case a half league and in the other more than thirteen leagues, they each thought they saw the meteor fall down near them. Such a fact evidently shows that this fall is by no means real, and that if the meteor seemed to descend towards the horizon, this circumstance without doubt is owing to the quick decrease of the angle of sight which measured its apparent height, as the meteor was in rapid motion away from the observers as it pursued its horizontal course.

The appearance of this isolated meteor showed a sufficiently remarkable resemblance to those which for some years past have been seen periodically towards the middle of November, to make it desirable that an opportunity should occur of verifying whether there are any amongst these last which really fall upon our globe.

The night of the 12th to the 13th of November, this year, appeared to me proper for this interesting inquiry, from the meteorological circumstances with which it was attended at Geneva, and which I hastened to avail myself of. Rather thick clouds completely veiled the heavens in a uniform manner; they occupied a very elevated region, where they remained stationary all the night. The temperature was mild, the air calm, and the darkness great, although no fog thickened the transparency of the atmosphere.

The barometer, the thermometer, the hygrometer, the magnetic needle, the ethrioscope and the electroscope were attentively watched at the observatory from seven in the evening to seven in the morning, and their progress marked with care every quarter of an hour. [m] At the beginning of the observations, at seven o'clock in the evening of the 12th the barometer reduced to the zero degree marked 725mm.08, the centigrade thermometer in the open air + 7°.8, and Saussure's hygrometer 87°. At midnight the first of these instruments was at 726mm.95, the second at + 6°.9, and the third at 93°. On the 13th, at seven in the morning, the barometer marked 729mm.30, the thermometer + 5°.2, and the hygrometer 98°.

m Two of the instruments, the compass and one of the electroscopes, belong to the Cabinet de Physique of our Academic Museum; these were kindly placed at my disposal, for which my best thanks are due to the directors.

To sum up, I shall say that the barometer, whose progress was gradually ascending, rose in the space of twelve hours of observation 4mm.22 ; that the thermometer, whose minimum had been + 5°.2, varied in the same space of time only 2°.6 ; and that the hygrometer proceeded 11° towards humidity. As to the othrioscope, it did not give (as might be anticipated, with a tranquil and regularly clouded sky) any sign of radiation of heat across the atmosphere. The pith-ball electrometers, placed in the open air, remained motionless ; lastly, the magnetic needle presented, at eleven minutes past nine, a slight division of 0°.5 to the east in declination ; a deviation which remained the same till a quarter of an hour after midnight, after which it varied, always in the same direction, and till the morning, between 0°.1 and 0°.7.

Assisted by three amateurs who wished to join me, a continued look-out was kept, not only towards the region of the east, but in every quarter of the heavens; the terrace of the Observatory commanding the entire horizon.

From seven to ten o'clock in the evening a light breeze prevailed, hardly perceptible, which blew from the north-east; and from ten in the evening till seven in the morning the air remained perfectly calm, excepting at three periods, namely, at two, at forty-five minutes past three, and at fifteen minutes past four, when a light breeze was again perceived, and lasted each time ten minutes.

At forty-five minutes past eight in the evening, and from the south-south-east, a feeble white light illuminated the upper part of the clouds for from three to four seconds. At fifty-one minutes past nine a reddish light, resembling lightning, streaked the upper part of the clouds for nearly three seconds, in the east. At forty minutes after eleven there were white glimmerings, very feeble, which streaked the clouds between the north-east and the south-east ; they had a kind of intermitting, and they lasted about six seconds. At thirty-five minutes past one, and directly in the east, there were, in the upper region of the clouds, some lights, in general very feeble, which continued during ten seconds. Lastly, at three minutes past four a white light, less pale, shone for two or three seconds in the elevated stratum of the clouds, in the south-east. But during the whole night, not a single luminous meteor, no shooting star, no aerolite or visible asteroid pierced the clouds to fall in the circle of our horizon. Nevertheless, it is probable that if the sky had not been clouded we should here have very well seen the shooting stars which were observed at the same date in our neighbourhood, in France and elsewhere ; and perhaps the magnificent spectacle which the sky presented at Geneva in the night of the 12th to the 13th of November, 1832, of which Professor Gautier gave an account in the fifty-first volume of the *Bibliotheque Universelle*, might again have been exhibited before our eyes.

The result, then, of our observations is, that the shooting stars circulate in a much more elevated region of the sky than that attained by the clouds, and that meteors of this kind rarely fall to the surface of the earth, if they ever do. This opinion acquires so much more probability, as no one till now, at least so far as I know, has been able to obtain an authentic specimen of this mysterious substance.

A learned astronomer communicated to the Academy of Sciences of Paris, in the session of the 5th of this month (December 1836) a curious and very interesting memoir, which appears to suggest that the luminous nebulosity by which the sun appears to be surrounded in the direction of its equator, a nebulosity which is projected far into space, assuming the form of a cone, and which has been known for two centuries by the name of the zodiacal light, might probably be the source of the myriads of shooting stars of the 13th of November, the earth at this epoch passing in the neighbourhood of the summit of this cone. Nevertheless, the author of the memoir, M. Biot, after having considered the subject under different views and discussed it scientifically, ends by declaring that he neither asserts nor rejects this identity.n

Some writers think that the origin of the shooting stars which compose the periodical phenomenon of the 13th of November, might also be ascribed to a great planet which may formerly have been broken into a multitude of fragments, which would continue to circulate one after the other in an orbit whose position is such that the earth approaches annually very near to it on the 13th of November. These fragments, endowed with a great velocity of projection, would enter our atmosphere at this period, cross it rapidly, and, by the friction caused by the resistance of the air, would grow so hot there as to become incandescent and to send forth a bright light until the moment of their quitting it.

This hypothesis, very ingenious as it may appear, is not free from objection. Already a celebrated philosopher, whose opinion is of great weight, has not hesitated to say that it would be premature to attempt ascending to the physical cause of these curious appearances until certain matters of fact had been cleared up o ; and assuredly M. Arago is right.

It is certain that in one and the same night an innumerable multitude of these meteors have been seen in places whose geographical situation differs 90° in longitude and six hours in time, a circumstance which gives to their appearance a duration of at least 18 hours; our

n *Comptes Rendus de l' Acad. de Paris*, No. 23, December 1836, vol. iii. p. 663.
o *Comptes Rendus de l' Acad. de Paris*, No. 23, December 1836, vol. iii. p. 663.

night being at this period more than 12 hours, and beginning 6 hours sooner than in the United States.

Now as in the month of November the earth advances in its orbit 415·500 leagues in 18 hours, a charge of place during which the appearances are incessantly succeeding one another, it would be necessary that these meteors, if they really constitue asteroids, should exist by millions in the zone where they appear. But then these heavenly bodies, which should approach so very near to the earth, must frequently fall down upon it, from the attractive power which the mass of our globe would inevitably exercise on them; and this is what has not yet been observed.

When astronomers at the beginning of this century had successively discovered Ceres, Pallas, Juno and Vesta, which revolve around the sun between Mars and Jupiter in orbits which have not a very great eccentricity, the idea of making asteroids originate from the fragments of a planet which might have been destroyed by means of an internal explosion was already put forth; but M. Biot remarked that, with regard to these four telescopic stars, this hypothesis is inadmissible, because, according to the theory of attraction, such an explosion would have necessarily given to these fragments unequal velocities of projection in starting from the same point, whence great unequal axes would have resulted, which is contrary to observation.*p*

It is known that Professor Brandes proved long ago, by corresponding observations made in different places and often repeated, that there are shooting stars which circulate with a velocity of 13 leagues, of 25 to a degree, in a second, at a height of 180 leagues above the surface of the earth *q*. It is also manifest, from the observations made in the United States compared by professor Olmsted, that the centre from whence the meteoric shower of the 13th of November of 1833 set out, was elevated at a mean height of more than 800 leagues, and consequently that it was in a region which affords no aliment for combustion. The vivid lustre then which these meteors exhibit, and which they could not borrow from the sun, is their own inherent property. But as in our planetary system we know of no celestial circulating body which shines with its own light, this essential fact, which must necessarily be kept in view, sufficiently shows the propriety, I would almost say the necessity, of considering shooting stars as a distinct class of phenomena.

In bringing together the different data furnished by observation, and in considering the particular circumstances connected with them, we may be led in some measure to conjecture that the source of this singular phenomenon is, perhaps, an electric focus, of which the determining cause is not yet known. But we must bear in mind that, in the region of hypothesis, and especially when we treat of a new subject as yet very little studied, analogy alone, whatever verisimilitude it may appear to possess, is not a basis sufficiently sure to found an opinion upon. I give this idea, therefore, only as a simple inference. It would, besides, be difficult to rank the shooting stars, which are seen unaccompanied with noise, in the catalogue of aerolites, whose fall, which often happens by day, is generally attended by a hissing in the air, by decropitation, repeated detonations, and a smell more or less intense.

According to a communication made last year to the Academy of Sciences of Paris *r*, M. Millot Doubenton observed on the 13th of November, 1835, at about nine in the evening, the sky being serene, a luminous meteor, having the appearance of an incandescent globe, which exploded in the air and set on fire a barn covered with wood and thatch, near the chateau of Lauzieres, in the department of Ain. M. Millot, according to his own account, is the only observer who saw the immense shower of fire that the meteor formed after bursting. This mere chance, which gave value to his observation, induced him to try if he could not find some stone of an unknown nature near the house and in the surrounding fields, and, indeed, he asserts that he picked up two of the size of a small egg. It is much to be regretted that the Academy after having begged M. Millet to send one of these specimens that they might ascertain its nature and make an analysis of it, has as yet kept silence respecting the examination of this meteoric product so interesting by its date.

Although thirty-seven years have passed since the 12th of November, 1799, the time when MM. Humboldt and Bonpland saw, at Cumana, a very unusual appearance of shooting stars which greatly excited their attention, our stock of knowledge respecting the cause and nature of this majestic phenomenon has remained very incomplete.

Without doubt we have yet to bring together many facts, to gather many observations, to arrange them, to discuss them in order to obtain a definitive solution of the problem. Recently, MM. Olmsted, Arago, Biot and other illustrious philosophers have been occupied with this

p Traite Elementaire d' Astronomie Physique, 2d. edit., vol. iii. p. 42.

q These quantities on the exactness of which we can rely, are the results of comparative observations begun in 1798 by MM. Benzenberg and Brandes, and continued on a greater scale, in 1823 by M. Brandes and his pupils, at Breslaw, Dresden, Leipe, Brieg, Gleiwitz, &c.—*Bibl. Univ.*, vol. li. p. 293; *Annuaire du Bureau des Longitudes de Paris* for 1836, p. 292.

r See the *Comptes Rendus*, vol. i. p. 414.

interesting subject. They have furnished ingenious ideas and fresh views, by which science will profit. It is true that some diversities are observable in the hypothesis which they have advanced, but these documents are not themselves the less to be prized and preserved. Who knows, but that the light, to the investigation of which every one earnestly applies, may not one day spring from the clashing of opinions?

3.—*On the question whether Shooting Stars are more numerous at certain times than at others. By* M. QUETELET. *t*

M. Quetelet informed the Academy that during the night of the 12th of November he employed himself at the observatory of the city in noticing the shooting stars, for the purpose of ascertaining, whether in fact, their appearance were more frequent than at another season. His observations presented nothing remarkable as to the number of these meteors.

We remember that M. Arago in giving to the Academy of Sciences at Paris an account of the results of the numerous observations which he had produced in support of this fact, quoted amongst other numbers as being extraordinary, that of 170 shooting stars which the students of astronomy in the observatory of Paris entrusted by him with making observations, had counted during the night of 13th of November. For appreciating this number, however, and establishing a comparison, facts were wanting, that is to say, the knowledge of the mean number of those meteors which may be observed in a night at any other season of the year. For the purpose of determining this number, M. Quetelet entered upon some investigations relative both to his former observations on shooting stars, and to those of other persons, and he arrived at this result, that the number of shooting stars which are observed, on an average, in an hour, looking constantly towards the same quarter of the heavens, is about eight, and that several observers, placed so as to observe the different regions of the heavens, may count double the number. Accordingly, the number of 170 shooting stars observed at Paris by several persons on the night of the 12th of Novemor would not be at all astonishing; on the contrary, it would come very near to the average number of these meteors which may be observed on a winter's night.

This result of the inquiries of M. Quetelet is important enough for us to give it, supported by all the documents which establish it.

M. Quetelet, before making known the observations which he recorded in 1824, with several other persons, remarks, that in making these observations his object was not to record the number of shooting stars which may be counted in a given time, but merely to bring together the elements necessary for calculating the height, the velocity, and all that has relation to the path of these meteors; it follows, therefore, that the results which they furnish ought to be considered as an under estimate, since many stars were not recorded, because the elements which should have served for their calculation were not sufficiently exact. The same remark must also be applied to the observations made by Benzenberg and Brandes in 1798, the results of which will be given, as well as those made by this last philosopher in 1823, the results of which will also be given.

The observations by Benzenberg and Brandes in 1798, were made in the environs of Gœttingen. These two philosophers were at first alone, and placed at a distance of 27,050 French feet apart. But after three series of observations they felt the necessity of being further apart, and they placed themselves at the extremities of a base of 46,2·0 feet, and this time each of them took an assistant to note down under his dictation the observations, the results of which are brought together in the following table :—

1798.	Shooting Stars observed by Benzenberg.	Brandes.	Number of Hours. Benzenberg.	Brandes.
Sept. 11.	9	11	2h 0m	2 19m
—— 13.	6	8	1 7	1 36
Oct. 6.	11	13	2 8	2 24
—— 9.	14	63	2 46	8 12
—— 14.	33	123	7 46	7 47
Nov. 4.	62	49	6 34	5 35
Totals....	135	267	22 21	27 53

* Mean number for Benzenberg, about 6 stars an hour.
Brandes, about 10 stars an hour.
Mean number, 8 stars per hour.

s See the article on shooting stars by Professor Olmsted in the American Journal of Science, or the French translation in vol. iii. of the *Compilateur*, October 1836, page 52; the notices of MM. Arago and Biot in the *Comptes Rendus des Séances de l' Académie des Sciences de Paris*, vol. iii. pp. 560, 629, 663; a notice by Professor Gautier, in the *Bibl. Univ.*, vol. li. p. 189, &c.

t From *L'Institut*, and originally derived from the *Bulletin de l' Acad. Royale de Bruxelles*.

The observations by Brandes in 1823 lasted two successive hours: they were made near the time of the new moons, and during the months of April, May, August, September, and October. The results are given in the following table:

Places of observation.	Shooting Stars observed.	No. of hours.	Mean No per hour	Number of the Observers.
Breslaw...	650	50	13 0	Brandes and his assistants.
Neisse.....	307	30	10.2	Several observers.
Miakan.....	65	8	8.1	One observer.
Gleiwitz.....	356	44	8.1	Two.....
Brieg.....	144	20	7.2	One.....
Trebnitz..... ...	36	6	6.0	One.....
Cracow.....	43	8	5.4	One.....
Leipe...	36	8	4.5	One.....
Berlin.....	7	4	1.8	One.....
Brecholshof.....	26	16	1.6	One.....
Dresden.....	40	26	1.6	Two.....

The following are the results of the observations which M. Quetelet made at Brussels in 1824 during ten evenings, together with those made at Liege by MM. Van Rees, and Plateau; and at Ghent by MM. Morren and Manderlier:

Places.	Shooting Stars.	Time.	Mean No. per hour.
Brussels	155	10h 26m	15.0
Liege	42	5 0	8.4
Ghent..... ...	51	5 30	9.3

After this communication of M. Quetelet, M. Sauvour stated, that being on the road from Brussels to Liege in the night of the 8th of last August, he observed a considerable number of shooting stars, of which several were remarkable for their size and brilliancy.

M. Quetelet suggests that this epoch presents a singular agreement with that of the 10th of August, which the results of observations of shooting stars point out as one of those which are to be remarked for the abundance of meteors of this kind. (See on this subject Brandes's *Untersuchen über die Entfernung und Bahnen der Sternschuppen*: Leipzig, 1825; and Chladni's *Feuer-meteore*, p. 89).

Wishing to aid in throwing more light on this interesting and yet little known branch of meteorology the Academy has resolved to propose for 1837 a series of observations on shooting stars.

4.—*On the Height, Motion, and Nature of Shooting Stars. By* M. QUETELET.[u]

Shooting stars, those meteors so long neglected by philosophers, are beginning at last to engage their attention. We ask ourselves how it happens, that whilst measuring even to the minutest circumstances the motion of those heavenly bodies which are at the extremity of our solar system, and which, by their very distance, escape the attention of the many, greater thought should not have been bestowed on a more careful examination of the nature and cause of the numerous appearances of these meteors, which, infinitely nearer to us, streak every night the surface of heaven, and are sometimes seen in such numbers that the heavenly vault would appear to resolve itself into a shower of stars.

Let us not, however, be in haste to suppose that nothing has been done upon this subject. We might almost be tempted to admit that the sciences also experience the influence and caprice of fashion, and that a certain class of researches can only interest at a certain epoch and under certain circumstances. Shooting stars, which had never been the object of an investigation expressly undertaken, were examined for the first time in a serious manner in 1798, by Benzenberg and Brandes, who examined them during many nights and at many intervals, with a view to determine their mean height, their velocity, and what belonged to the nature of their trajectory. In 1823, Brandes seconded by a tolerable number of observers placed in different stations, resumed the same work. At nearly the same time (1824), I undertook, with the aid of from twelve to fifteen persons, similar observations, which were made at Brussels, Ghent, and Liege. I know not whether other regular observations of the same nature have been made since. Only, at my request, seconded by Sir John Herschel, the English scientific men assembled at Cambridge in 1834, thought proper to propose this subject of inquiry in the list of objects worthy to engage the attention of observers. The Royal Academy of Brussels has just come to a similar resolution.

u From the *Annuaire de l' Observatoire de Bruxelles* for 1837.

Now, combining the results of the observations made in Germany and in Belgium, the following are the principal conclusions which may be deduced from them.

1. The *height* at which shooting stars appear varies within very wide limits; nevertheless the mean height may be considered as being from 15 to 20 leagues of about 20 to a degree, that is to say, near about the limits of our atmosphere. The two series of observations made in Germany, gave:

SHOOTING STARS.

Height.	In 1798.	In 1823.	Total.
1 to 3 German Miles..	1	4	5
3 to 6.....	2	15	17
6 to 10.....	3	22	25
10 to 15.....	6	35	41
15 to 20	2	13	15
20 to 30.....	2	11	13
30 to 40.....	1	3	4
15.7	...	1	1
60.....	...	1	1
100 and more...	...	1	1

2. Shooting stars have in general a direction *inclined* towards the surface of the earth. Of 36 computed trajectories, Brandes found 26 descending ones, 9 ascending, and 1 horizontal; 13 formed an angle of less than 45° with the vertical; 11 were between 45° and the horizon; 8 between the horizon and 13°; and only 1 was still more elevated. With regard to the azimuths, of 34 trajectories, 23 had a direction southwards and 11 to the north. 21 to the west, and 13 to the east. Separating the shooting stars into two groups, we find 25 of them whose course inclines more to a south-west direction, or whose azimuth is less than 135° to the west and 45° to the east, and only 9 are in the other half portion of the heavens. This difference seems to be connected with the direction of the motion of the earth in its orbit, admitting that the meteors in question may be considered as small asteroids.

3. The *brilliancy* of shooting stars is very various; these meteors sometimes surpass Jupiter and Venus in light, and sometimes they are only perceived by the help of finders. Some leave after them luminous tracks visible for some seconds after their passage, which are not to be confounded with those luminous and rapid traces which depend upon the length of the sensation on the retina. The trajectories appear generally as straight lines. Some of them, however, are very sensibly curved; they are far from exhibiting a continued brilliancy in their whole extent.

4. The *velocity* of shooting stars has not been capable of determination with any precision except for a very small number of those meteors [v]: it is from 3 to 10 leagues a second.

5. As to the *mean number* of shooting stars which can be observed at any given epoch of the year, after having particularly examined this question [w] (*Bulletin de l' Acad. Royale de Bruxelles*, vol. iii. p. 401, *et seq.*), I have come to this result, that a single observer or several observers directed towards one and the same region of the heavens can see, on an average, eight shooting stars an hour, and that several observers, placed so as to see the different regions of the heavens, may reckon twice that number of them.

6. It would seem that a cause exists which produces, from about the 8th to the 15th November, more frequent appearances of shooting stars. I have also thought that I remarked a greater frequency of these meteors in the month of August (from the 8th to the 15th).

7. As to the *nature* of shooting stars many doubts still remain on this subject: are they to be considered as asteroids, according to an hypothesis of some standing; or as stones shot from the volcanoes of the moon, according to the opinion of Benzenberg, Chladni, and other physicists *x*? I should be inclined to think that a distinction must be made between the shooting stars which leave luminous trains after them, persistent and often characterized by sparks, and those whose course is marked by a trace of light as momentary as the appearance of the star, and which is only owing to the duration of the impressions on the retina. The first appear to me to be really bodies foreign to our earth. The 31st July 1824, I observed an aerolite, or luminous mass, which presented very remarkable circumstances, left sparks on its passage, and must have fallen in the neighbourhood of Antwerp.—*Madras Journal of Lit. and Science*, Vol. VII., pp. 163-180.

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v For six of these meteors whose velocity I was able to calculate, I found 5 leagues, 7·6, 4·5 3·0, and 3·4, mean 4·7 leagues.

w See the preceding paper.—Edit.

x *Die Sternschuppen sind Steine aus den Mondvulkanen*, *Benzenberg*, *Bonn*, 1834.

ART. XIV.—*Preliminary Remarks on the Nahrwán Canal,* with a glance at the past history of its province.* By Commander F. JONES, I. N.

No. 3317 of 1850.

From A. MALET, Esquire, *Chief Secretary to the Government of Bombay.*

To G. BUIST, Esquire, *Secretary to the Geographical Society, Bombay.*

POLITICAL DEPARTMENT.—DATED 12*th July*, 1850.

SIR,—I am directed by the Right Hon'ble the Governor-in-Council to transmit to you, for presentation to the Geographical Society, in the name of Government, and for publication amongst the proceedings of the Society, a Narrative of a Journey undertaken by Commander Felix Jones, of the Indian Navy, for determining the tract of the Ancient Nahrwan Canal, accompanied by a Map, Plans, and Sketches, in illustration thereof.

I have the honor to be, Sir, your most obedient servant,

BOMBAY CASTLE, 12*th July*, 1850. A. MALET, *Chief Secretary.*

DURING the greater part of the year, that portion of Arabia Irak lying to the east of the Tigris, except on the few beaten tracts of commerce, is almost as difficult of access as the most impenetrable regions of the globe. The absence of water in the district, and the character of the predatory tribes that traverse it, have prevented travellers from exploring this interesting region, and it has in consequence remained all but a "terra incognita" to the European world. Desert as it now is, it was once one of the most fruitful provinces of the classic land, which, rich in the element that nature has provided for fertilization and for the support of animal life, required but the labour and skill of man to distribute it, in aid of the purposes for which it was designed. As a prolific source of revenue, the value of water was not only fully appreciated by the ancients, but an eminent skill, if we may judge by the decayed remains that are displayed to us, pervaded the system employed for its circulation over the vast plains comprising the territory of Irak.

Mesopotamia was traversed by canals in every direction, that in their construction required but little beyond the labour of excavation. The region we are treating of, however, comprising a tract of 400 miles in length with an average breadth of fifty, bounded on the east by hilly ranges that declined with an easy and very gradual descent to the Tigris, demanded a degree of hydraulic proficiency compatible to the undertaking in the distribution of water over so large an extent, and in

* Refer to last page of these preliminary remarks, where my reasons are given for adopting a name for the whole that is really applicable only to a part of the canal.

the construction of the Nahrwan Canal it was eminently displayed. Numerous petty streams were diverted from their natural course to furnish an efficient supply to the contemplated work, and a considerable river, the Gyndes of antiquity,* was also absorbed in it on its way to the south.

Of the rise and progress of the canal, history affords us but scanty information. Its origin is ascribed to the wisdom of the renowned Shapur Zalaktaf, and its repairs, improvements, and extension, to Khusru† Annushirwan, perhaps the greatest monarch that ever presided over the destinies of the Persian empire. In his time, or more probably in the early annals of the voluptuous Khusru Parviz, it must have attained the height of its celebrity and usefulness. On its banks an agricultural and warlike population had erected villages and towns, and at convenient distances its stream was spanned either by solid structures or the more handy floating bridges.‡ The adjacent country, plentifully irrigated by lateral cuts from either side of the trunk stream, abounded in date groves and other trees, that lent their shade to the traveller, for its course was then the highroad that led to the south-eastern districts. Expansive fields that exhibited a perennial verdure, must have moderated in some measure the torrid heats that are now felt, by protecting the soil from the burning suns of the summer months. These fields, studded with the habitations with the flocks and herds of a semi-agricultural, semi-pastoral community, must have rendered Arabia Irak the most valuable district of the Persian Crown, from whence indeed it derived the greatest portion of its stupendous revenues. Parks and pleasure grounds, palaces and hunting seats, of the Sassanian monarchs and the nobles of the land, served to diversify the glorious scene, whose beauty was further enhanced by the splendid array of the Persian armies that went forth to combat the legions of Rome, who since the defeat and death of Julian on this very soil,§ had sustained a succession of reverses that added much glory to the Persian arms, and to the prosperity of the province.

* The modern Diyaleh and the Tamerra and Holwan of the Arab Geographers at the time the Nahrwan was in active operation. I presume that most of its water flowed into the Klalls canal, and crossed the Nahrwan, or rather Katul, in the present line of its course.

† Kesra Anushirwan is, I believe, the proper form of the monarch's name.

‡ See the MS. of an anonymous writer subsequently quoted. The work is entitled the Kitabal Akalem, and gives a detailed list and description of the canals of Babylonia and Chaldea.

§ The last scene of the Emperor Julian's life must have closed in the immediate neighbourhood of the Nahrwan, and it is not improbable that the disasters the Roman troops experienced in their retreat to the Tigris on the subsequent day, were owing to the nature of the dykes, and the facility they afforded for the concealment of a vigilant enemy.

This prosperity was, however, but short-lived. The latter part of Khusru Parviz's reign brought with it calamity and disgrace. The Romans, led by Heraclius, again recovered a portion of their former energy, and the tide of fortune once more favored—but for a brief time only—the imperial standard of the West. The Nahrwan was near the scene of conflict, and the final overthrow of the Persian force, that ended in the ignominious flight of the most magnificent of the Sassanian kings, took place in its immediate vicinity. The irruption, indeed, was as sudden as its success was complete, and devastation quickly followed in the wake of the Roman arms. The empire was overran with foreign troops, who, adopting the barbarian customs, in revenge for the injuries their own country had sustained, wasted the soil, and gratified the spirit with which they were actuated by the destruction of its towns, and particularly of its public edifices. Bridges and canals doubtless participated in the general wreck, and we may, therefore, I think, identify the epoch with the first decline of the Nahrwan.

Persia indeed never again recovered from the blow inflicted on it by the legions of Heraclius, and the Mahomedan conquest of the country, after the decisive battle of Qadesiyeh, must for a time have rendered the banks of Nahrwan a scene of indescribable horrors and confusion. Ctesiphon* or Madain, the western capital of the empire, in which the splendid palace of its monarchs stood, was now occupied by the rude hordes of the desert, and the waters of the great Nahrwan, that prior to the Roman invasion under Heraclius had contributed only to the peaceful wants of the inhabitants of this part of Arabia Irak and the enriching of its soil, were a second time mingled with the blood of its panic-stricken and flying people. Mahomedanism now succeeded to the tenets of Zoroaster, in the new territories that the converting sword had acquired, and the naked Arabs that accompanied Syed-ibin-Wakas, the general of the Kalif 'Omer, in his invasion, soon occupied the deserted residences of the dispersed race, not only in the metropolis but in the villages on the banks of the Nahrwan also.

* In the Kamil of Ibn Ashir we find Ctesiphon written under the form of Tyspun, and as such may claim to be considered as an old Persian name, probably originating with the Era of the Parthians. The name has been generally supposed to be Greek. The Arabs however seldom copied from them, and in this case it is not improbable that the Greeks procured the appellation of the city from the Parthians or Sassanians. The name is now lost in the country, and indeed is seldom seen under this form in the old writers, but generally is mentioned as Madain, a term signifying "The Cities," from seven towns having stood on the peninsula occupied by the great palace. The name it is at present known by to the Arabs is Tak Kesra, or "Arch of the Cæsar," from the magnificent arch still standing in the centre of the great palace.

Under the governments of the Lieutenants of the early Khalifs, the province for a time revived, though the Nahrwan, from its admirably defensive position, became the resort of the disaffected and refractory Chiefs. The Khuarij, or rebels against the spiritual authority of the Khalif 'Ali, here made head against the son-in-law of the Prophet, but were defeated in a severe action termed the battle of Nahrwan,* in A. H. 38, in which, after an immense slaughter, he secured to himself the quiet possessions of Arabia Irak against the power of Ommiyeh, his antagonist in Syria. In the succeeding struggles for the Khalifat, and prior to the rise of the Abbassin dynasty, Arabia-Irak alternately rose and fell amid the dissensions of the followers of the Koran and the religious schisms that threatened to destroy the newly-created faith. The rise of the house of Abbas after the murder of Ali and his ill-fated sons, gave a lengthened peace to the disrupted province, and the founding of Baghdad by Mansur, the second Khalif of that race, in the immediate vicinity of the Nahrwan, conduced to the repairs of the canal, and a partial return to its pristine state and usefulness. Under the glorious reign of Harun-al-Rashid it contributed to swell the revenues of the Kalifat, and to that wise prince is due its repair and augmentation.† At what precise time it ceased to be peopled, we have no means of learning, nor indeed, with the exception of Bakuta and Aberta, can we at present identify a single name out of the numerous catalogue furnished in the following MS., written in about 350 of the Hejreh.‡ It says—"From the Tigris is also derived another canal to the eastward, called the Katul, or the Kesrawi. It leaves the Tigris a little below Dur al Harith, and continues its course to the Kasri Mutawakil, which is now usually called Jaferi, where it is spanned by a fine stone bridge. It afterwards flows to Itak hiyeh, where it is also crossed by a bridge named Kantaret§ al Kesrawiyeh. The next place it reaches is Mahummediyeh, where there is a floating bridge or pontoon termed Jisser-al-Zowarik. It afterwards continues to the large village of Ajmeh, and below this is Shadiwan. The stream then passes Mamuniyeh, (probably built in the time of Kalif Mamun)—a large village,

* From the Kamil of Ibn Athir, in the description of the revolt of the Khuarij.

† See Yakuts M'ajm al Buldan, under the head of Katul.

‡ I am indebted to Major Rawlinson, C. B., for this notice of the Katul and Nahrwan, and indeed for much local information regarding them.

§ Kanterch signifies a solid bridge built either of brick or stone, while Jisr denotes a bridge of boats or pontoons. Kanatir is the plural of the former term.

and reaches next a district called Kanatir, where are many villages and abundance of cultivation: from whence it extends to the villages called Sula and Bakuba. Here it takes the name of Tamerra, and flows on to Ba-jisra (form of bridge.) It next proceeds to the bridge called Jisri-Nahrwan, and here it derives its name of Nahrwan. From this it passes in succession the upper Shadiwan, the Jisri-Buran, and Aberta. After that it extends to Resatiyeh, and so on to the lower Shadiwan, which is a flourishing and well-peopled village. It then runs to Askaf beni-Joneyd,* an extensive city built on both sides of the canal,—which then flows on amid continuous extensive villages, date-groves, and well-cultivated lands, and disembogues into the Tigris a little below Budlai."

This is a fair picture of the prosperity of the region watered by the Nahrwan, in the time perhaps of the Khalif Mamun, at which period (200 A. H, A. D. 822) it could scarcely have recovered from the universal depression caused by the total wreck of a mighty empire, like that of the ancient Persian, by the convulsions of a nation struggling to uphold an old religion against the forced doctrines of a new one maintainable only at the point of the sword,—and by the intestine troubles that sprung up among the sectaries of the new faith prior to the peaceful establishment of the Abbasin Khalifs in Irak. It is improbable, indeed, that the Nahrwan ever enjoyed under the Khalifat the same advantages of an active superintendence, as it did under the matured government of the Shapurs, and consequently the district must have attained but a proportionate degree of prosperity, for canals, such as it is, dug for the most part through an alluvial soil, that was experiencing constant sedimentary additions by washings from the uplands above, must have required a periodical dredging which under the feverish dominion of the Khalifs, we may imagine was neither regular nor effective.

At the time the extract I have quoted was written, Baghdad, the seat of the supreme power in the East, probably had been founded about

* The Askaf-beni-Joneyd were formerly lords of the country. Two towns went by their name on the Nahrwan. The one termed Askafat 'Ala, the other Askafat Salleh. They are stated to have both occupied the left bank of the Nahrwan between Baghdad and Wasit by some authors, and are described as having been ruined on the decay of the canal in the time of the Seljuks, owing to the dissensions of the Empire and the ravages of the troops The anonymous MS. however places these towns on either bank of the Nahrwan. See Yakut's epitome, and the work of an anonymous writer entitled the Kitab-al-Akalim.

two centuries, and under the government of Harun-al-Rashid, the fifth Khalif of the Abbasin family, had become the school of literature and science, and the abode of learning, industry, and the arts. Distant but ten geographical miles from the proud city of the Khalif, the Nahrwan, doubtless, received a portion of the attention that he bestowed upon every thing contributing to the welfare of his kingdom, and indeed, as I have noticed before, the authentic history of Yakut* details its restoration and extension under this prince's administration. Progressive improvements have, however, never been a lasting feature in the history of these coveted lands, and accordingly we find the successors of Harun embroiled in quarrels with their own guards, who had been hired as mercenaries, and subsequently attained so much power as to oppress the people and threaten a revolt. The constant disturbances, indeed, between the citizens and the soldiers, led Matessem, the eighth Khalif, to abandon Baghdad, and to raise Samarrah, then an obscure village and the locale of a military camp, in the northern districts of the Nahrwan, to the eminence of a capital. For eighteen years only it held its place as a metropolis, and this short time witnessed the succession of seven Khalifs, three of whom were foully murdered by the strangers to whose fidelity they had entrusted the safety of their persons and the guardianship of the honor of Islam. In the time of such anarchy and confusion, agricultural pursuits, and the improvement of the resources of the country, must be despaired of. The newly erected empire was, in fact, on the decline, and the uneasy position of Matamed, the fifteenth Khalif, compelled him to restore to Baghdad the dignities it had been deprived of, by again making it the seat of government. Thus in the space of 300 years, a district of 90 miles in extent only, had been either honored, or deplored, as the locality of three capitals—Ctesiphon, Baghdad, and Samarrah,—which, for barbaric wealth and architectural adornment, have alternately claimed the admiration of the world.

In the selection of the ground for the latter cities, the Abbasin sovereigns doubtless considered the admirably defensive barrier the artificial Nahrwan presented to the East, and the natural limit of the broad and rapid Tigris to the West. The Nahrwan must have been devised indeed by the Sassanian kings for defensive as well as for agri-

* M'ajm-al-Buldan, under the chapters Nahrwan and Katul.

cultural purposes,—and deep and rapid as it was, doubtless served as an efficient outwork to the great capital of Madain, and subsequently to the cities of Baghdad and Samarrah. In the annals of the early campaigns undertaken by the Greeks and Romans against the Parthians and Sassanians, we find the armies led into Mesopotamia nearly on the route followed by the younger Cyrus and the ten thousand Greeks, either along the banks of the Euphrates, or by descending that rapid river in boats built on its upper course. So long as Seleucia, for a time the Syro-Macedonian capital of Mesopotamia, remained a Greek colony, this road had the advantages of supplies and a friendly people, who, if not inclined to assist the Roman legions in the passage of the Tigris, at least could offer no serious molestation. Subsequently, however, to the destruction of Seleucia, and prior to the ill-fated expedition which Julian led against Ctesiphon, the more northern roads either by Nisibin and Sinjar, or through Armenia, had been followed by the Roman generals, and a comparatively easy descent had been made by this route into the Assyrian plains eastward of the Tigris. At a proper season* prior to the construction of the Nahrwan, the streams crossing this portion of Arabia-Irak offered no obstacles to the passage of an army up to the very gates of Ctesiphon; and the mode of defensive warfare adopted by the ancient Persians, of laying waste the country before the approach of an enemy, became – though self-inflicted—a serious national injury. These considerations, apart from agricultural advantages, were sufficient inducements for an enlightened prince to reflect on the best mode of remedying such formidable evils, and it is not therefore improbable that the Nahrwan owed its construction to these very causes. In whose reign the defensive bulwark was commenced, or to what monarch's sagacity it is due, is uncertain; but the magnitude of its conception and design is worthy of any of the early Sassanian kings, and considering the character of the founder of the dynasty (Ardishir Bebegan, or Artaxerxes†) it might well be ascribed to him. The execution of the great work, however, interrupted as it must have been by the constant wars that were undertaken, may have been deferred until the

* In September, October, and November.

† See the Code of Laws instituted by the first Sassanian Monarch, where agriculture is deemed the true source of national prosperity.—Conder's Persia, page 94.

long peace of forty years* was concluded and faithfully kept between the rival nations, and in the protracted reign of Shapur Dalaktaf, according to tradition, we may date perhaps the completion and opening of the canal. Unlike the Babylonian vestiges, whose era is traceable by the inscribed character upon them, the Nahrwan in its ruins presents nothing to warrant us assigning it to an age earlier than the Sassanian, though gems and cylinders peculiar to Babylonia and Assyria are frequently found in its neighbourhood. These we may presume were taken there from Mesopotamia, and may, indeed, have been considered as relics by the Sassanian population of Arabia-Irak, in much the same way as we occasionally meet with them as decorations on the persons of the females and children in Arab families of the present day.

The middle of the ninth century of the Christian Æra witnessed the decline of the power of the Khalifs of Baghdad, and the next two centuries beheld their empire torn by civil dissension, caused by the oppression of the Government and its soldiery. The distant provinces revolted, and in 1055 A. D. Baghdad itself passed into the hands of the descendants of Seljuk, who had previously made themselves masters of the eastern provinces, and the fertile plains then bordering on the Nahrwan. From this time until the extinction of the sovereign power of the successors of Mahomed, by the death of Mastassem the 37th, and last Khalif who was murdered by Halaku, the grandson of Tengis Khan, in the taking of Baghdad in A. D. 1258, the greatest disorders prevailed from the shores of Europe to the banks of the Indus. Provincial Governors had thrown off their allegiance, and were contending with each other for supremacy, while the Seljuks and an insolent soldiery were aiding in the general wreck.

Their retirement and decline had left but a brief period of tranquillity, when the final blow was struck at the territory, and Baghdad fell never to rise again as the capital of Islam, with the loss of 1,600,000 of its inhabitants, to the powerful Halaku and his invincible Tartars. In 1401 A. D. that scourge of his species, Timur Turk, visited the fallen province a second time as a conqueror; erecting on the ruins of its city, as a trophy of his prowess, a pyramid of 90,000 heads shorn from the bodies of its unfortunate people. A century later a new infliction in

* Gibbon's Decline and Fall of the Roman Empire. This treaty was enforced on the Persians after they had suffered severe reverses in the reign of Narses, and their humiliation doubtless led them to plant the formidable barrier of the Nahrwan and Katul between themselves and their protected enemy, Tiridates, the neighbouring king of Armenia.

the irruption of the Beni Joneyd hordes added to the calamities and distress of the persecuted region, which now became incorporated with Persia under the Government of Shah Ismail Sefi. After his defeat, however, by Sultan Selim in A. D. 1514, the territory for the first time yielded to the Turks, but in the reign of Shah Abbas (1603) Baghdad and its dependencies again averted to the Persian Crown by his successes over the Osmanli forces. In 1638 the Turks recovered possession of the territory, and Baghdad has since remained the capital of a Turkish Pashalic, though Nadir Shah in 1735, and Mahomed Ali Mirza in 1821, respectively advanced against it with a large army. The former was however compelled to raise the siege of the city by the bravery of its garrison, and the latter fell a victim to cholera before he could carry out his designs.

Under the accumulated miseries that a succession of wars and internal anarchy had heaped upon the province and the city,—which last, by a singular fortuity and perversion of terms, has been "par excellence" denominated the "city of peace,"*—we are not at a loss to account for the decay of its canals. In the dreadful carnage that is recorded to have followed in the footsteps of its various conquerors, we can picture to ourselves the substitution of blood for water, both in the Nahrwan and the Tigris. The sanguinary tide, indeed, while swelling their streams must have depopulated the villages to whose inhabitants the preservation and repairs of the canal were confided, and as these works by continuous neglect contribute annually to their own destruction, we may presume the restoration of the Nahrwan became in time a financial difficulty that the impoverished country did not afford to practice. From the Arab writers we learn a superstitious fatuity also prevailed, that prevented any attempt at re-excavating the canal, for a tradition was handed down, to the effect that death was the certain lot of all who were public-spirited enough to essay the task,† and thus has this fine

* "Dur-al-Sellam." The name given to Baghdad at the present day even.

† Yakut in the Majin-al-Buldan, and other authors, enlarge on the fatality attending those who undertook the repairs of the Nahrwan. The learned geographer named Mooez-ed-Dawlak Abul Hussein, and Ahmed ibn Beyeh-al-Delimi and others, as contributing to these repairs on more than one occasion; but they were never stable, I presume, from their negligent and partial character. When the Nasr-al-Doulah-al-Hussyn ibn Ahmed came to Baghdad, he contributed 20,000 dinars, about £10,000 (sterling,) towards its restoration, but subsequently abandoned his spirited design, being persuaded from attempting it by the fatality with which it was connected. So much had the resources of the country degenerated, we find that in A. H. 326, during the Vizirat of Mahomed-ibn-Raik-ol-Rufi, the revenue derived from the Nahrwan amounted to no more than 500£ or 1000 dinars annually, whereas Yakut relates that its revenues as reported in the time of the Sassanian kings, were equivalent to £600,000 sterling: at present, alas! it yields not a para to the State.

country, that wants but the labour and skill of man, in an era of peace to render it the granary of the East, become a desolate and almost impassable waste. Won by the sword, it attained by blood an illustrious position in the history of the world, and by a just gradation of calamities inflicted by the same weapon, it has sunk to its present abject condition. Its costly capital, that erst displayed the pride and magnificence of the Khalifs, now a mass of ruins, is misgoverned by an old and insatiate Pasha. Its oppressed people, awed even by an undisciplined military despotism whose power extends not beyond the circuit of the city walls, are loud in their complaints ; and avarice, that prolific source of national corruption, is fast destroying the remnant that is left. Every succeeding year witnesses a further decay of this fine province, and the few merchants that are left in its towns and cities, subject to constantly increasing imposts levied for the gratification of individual appetite, and not for the improvement of the country, are flying to more prosperous and less exacting regions.

Such is the present aspect of Turkish Arabia, into which I have been inadvertently drawn by a review of its past history. This I have tried to render as concise as possible, to give a greater interest to my researches on the line of the Nahrwan,—the dried-up fountain of its former prosperity. We contemplate, indeed, its present aspect with the same eye as a speculating observer would contemplate, after the lapse of centuries, the exhumed but only partially decayed relics of one of our species,—convinced only of the reality that its essence has passed away while we are lost in vain conjectures as to its name and identity. It is thus with the highly gifted region once watered by the Nahrwan. We can see in the destruction of the canal that the artery of its existence has been severed, and with it has fled vitality and being. But beyond this we have no clue to the identification of its towns and villages, and the name of the race whom the Arab geographers in comparatively recent times describe as the "lords of the country," is as obsolete as that of the structures they inhabited.* "Sic transit gloria mundi."

This brief attempt to assign an origin to, and a cause for, the construction of the Nahrwan, is purely conjectural, and principally founded upon events that are recorded in the obscure notices of the country

* See former note, in which the Beni-Joneyd are described as the "lords of the country." These Beni-Joneyd were, I believe, the ancestors of Shah Ismail Sefi, and originally possessed the country in the neighbourhood of Dianbekr. The name is now as a dead-letter in this part of the world, though they were in power but three centuries ago.

prior to the Mahomedan conquest, before which time we knew of the existence of the canal only from the letters of the Emperor Heraclius to the Roman Senate, contained in the Paschal chronicle. We may presume, indeed, that the difficulties of its passages prevented the Emperor from following up his successes by an assault upon Ctesiphon.

In these letters, and in the records of Simeon the Logathete, the orthography of the name according to the notices of it in the learned paper on the Atropatenian Ecbatana, by Major Rawlinson,* is accurately given in the Greek form Narban, but by Theophanes and Cedrenus as Narba and Arba† respectively. At the present day the whole line of the canal bears the name of Nahrwan among the ignorant tribes that wander in its vicinity, but this name, from the authority of Yakut and others, is really applicable only to the portion of the canal that flowed to the S. E. of the modern Diyaleh. It is difficult to decide on the construction of the name. "Nahr," in Arabic, is the word applied to all excavated channels for the conveyance of water—but the etymology of the last word is somewhat obscure: "wan" in Persian signifies "a keeper or guardian," and if a combined Arabic and Persian form be admitted in the construction of proper names, we should have in Nahrwan a not inapt appellation for the protecting bulwark of a large capital like Ctesiphon. Perhaps, indeed, the Arabic word "wan," denoting "an alcove or hall," applied to the great hall of Khusru's palace still standing at Ctesiphon, may have been contracted into, and then we should have the more euphonious title of Nahrwan for Nahriwan, signifying "the stream of the hall." The former derivation, however, is perhaps the more reasonable, for we find "wan" frequently terminating the name of Persian rivers, giving the sense apparently of "boundary" to a district. I may instance the Abi Holiwan, and the Abi Shirwan, branches of the Diyaleh, bounding the district of Zohab. Yakut,‡ however, deems the term "wan" of Pehlevi origin.

That portion of the canal N. W. of the Diyaleh, according to the Arab geographers, was named indifferently Katur or Katul,§ thus distinguishing it from the Nahrwan, its continuation S. E. of that river. The

* Royal Geographical Journal, Vol. X. Part I. page 93.

† Notwithstanding the Major's protest made ten years ago, against these corrupted orthographies being used in our maps and works at the present day, I see by a recent work entitled "Ancient History," that these names still disfigures its pages.

‡ Majin-al-Buldan, under the head of Nahrwan.

§ See note page 93, Journal Royal Society, Vol. X. Part I.

name Katul, indeed, is still preserved in the country, for we now find it as distinguishing a more recent excavation, running parallel to at a distance of one mile south from the original canal of the name.* It was opened, it is said, in consequence of the real Katul absorbing all the water from the regions N. E. of its course, without discharging any of the essential article through lateral cuts to the south, and thus rendering the country embraced between the real Katul, the present course of the Diyaleh and the Tigris, a perfect waste.

The absence of any canals emanating from either bank of the real Katul, would show, too, that its waters were required for a more extensive irrigation in the lower country to the south, and therefore the upper and more northern excavation must be regarded not only as the most ancient, but must be viewed merely as a trunk or conduit that received, but did not dispel, its contents until a point had been reached where they could be distributed to advantage. The lower or more modern Katul was evidently dug for a distinct purpose, and not, as has been generally supposed, originally designed to communicate with the Nahrwan,† but on the contrary was in no way connected with it, until the decay of the original Katul led them, as I supposed, to open a passage from it into the spurious canal, to save the banks of the latter from the destruction that the confined waters of the former would doubtless create. This opening is now distinctly seen connecting the two Katuls close to the spot where the Tigris (from an alteration of its course) has encroached upon them in the neighbourhood of the modern village of Sindiyeh, and the circumstance of their junction has, I presume, con-

* With the usual confusion of the g for the k, it is more frequently called the Gaitul by the modern Arab,—and with this orthography it will be recognised in Lieut. Grounds' able paper on the canals emanating from the Diyaleh. I gladly avail myself of this note to record the assistance I derived from the points fixed in this locality by Lieut Grounds, and at the same time to express my obligations to that scientific officer, Captain Henry Blosse Lynch of the Indian Navy, for generously placing the whole of his valuable papers and geographical records at my disposal. These, when they reach me, will materially aid in my labours, especially in parts of the country where I may not have the same opportunities of visiting as he had.

† I have, since this was written, changed my opinion on this point, for in a journey made this month, when the Diyaleh was very low, I have determined the course of the both Katuls, on the East of the Diyaleh, as low as Sifwah. The Katul-al-Kesrawi was led into the old bed of the Diyaleh, as I had previously imagined,—indeed, as it is described in page 22 of these preliminary remarks; and the Katul now under consideration is seen contiguous to it, as represented by the map, and evidently led to the Nahrwan after the decay of the former. Their course led over the ground cut through by the modern Diyaleh, (whose old bed is distinctly marked) to Sifwah, and the point of the canal's junction with it is seen as perfect as ever about a mile W. S. W. of the modern Bohriz. The canal on the west of the Diyaleh that I have erroneously termed a continuation of the lower Katul, is, therefore, only a branch of that conduit that watered the country north of Baghdad, between Baghkuba or Bakuboh, and a place called Khirr-al-Sifin. It was however connected with its trunk stream in several places, particularly at Kidri, where the connection is very plain.

tinued the name of the canal to the one that was latest in operation. The conformation of the lower Katul would alone show, even had I not traced its course, the purpose for which it was designed, for while its northern or left bank remains entire, the right one is opened in various places to admit its waters in lateral ducts that overspread the country from the northern Sindiyeh to the point of confluence of the Diyaleh with the Tigris. Here its functions ceased, and the Nahrwan's usefulness came into operation in earlier times, and thus the fertility of the whole district was skilfully provided for. Subsequent, however, to the decay of the real Katul, the modern one of the same name reached to the point of the former junction with the Nahrwan,* and contributed in some measure to restore the prosperity of the province.

Yakut, in his description of the Katuls, would assign to the name an Arabic etymology from or signifying "a cut segment" or "amputation," and however ingenious his theory may be, we must, I think, prefer Major Rawlinson's derivation from the older form of Katur, by which name it was originally designated. In his itinerary of the march of Heraclius, he has satisfactorily shown that the Tarna of the Emperor's campaign is identical with the Katur of the Arabian geographers, from the similarity of the terminating syllable of the compound to the names given in the records of Theophanes and Pliny,—and supposes the word to have become Arabicised from the Persian "kau" signifying an excavation, and "tur" the name of a town now represented by the modern village of "Dur," from which the canal emanated.† The fact, too, of its existence in the era of the Sassanians, warrants the appellation being considered as of Persian origin. By the Arab writers, indeed, the old Katul is designated as the Katul-al-Kesrawi,‡ or the "Katul of the Kings," and is clearly distinct from the spurious or southern Katul, and has now usurped the appellation. The former, I presume, was decayed even in the early era of the Abassin Khalifs, and the repairs and augmentation the latter underwent during the sovereignty of Harun-al-Rashid, is evidently intended, I think, to mark the period when it was conducted to the Nahrwan, joining at or very near to the same point of

* Yakut describes the Katul of Harun-al-Rashid as joining the Nahrwan at a place called Shadrwan,—probably the position of the ruined dam in the bed of the Diyaleh.

† Note to page 93 of Royal Geographical Journal before quoted, and in the body of the page itself will be found the interesting dissertation to which I allude.

‡ Kesrawi was the royal title of the Sassanian kings of Persia. The singular Kesra is evidently analogous to, and probably adopted from, the Greek Kaiser or Cæsar: the title is still extant in the Germanic Kaiser, at present borne by the Austrian Emperors.

contact as the original Katul. The Arabs at present state that two dams are still to be seen in the bed of the Diyaleh, the one observable at ordinary low periods, being perhaps that constructed as an embankment for the modern Katul,—while that visible only in extraordinary shallow seasons may have reference to the more antiquated conduit of the Sassanians.* The name Katul, however, appears to have ceased on both the ancient and modern lines in the vicinity of Bakubá, from whence to the point of junction with the Nahrwan on the course of the old Diyaleh river, the canal would seem to have borne the discriminative appellation of Tamerra or Holwan.† The latter name is now applied to a branch of the Diyaleh that joins the trunk stream near Kizbrobat, and the former may be traced I think in the present designation of a lateral duct from the Nahrwan, that formerly watered the country N. E. of Ctesiphon.

Before entering upon the general geological and geographical description of the tract watered by the combined streams of the Katul-al-Kesrawi and Nahrwan, I may as well give the description of what I term the spurious and more recent Katul; extracted from the Kitab-al-Akalim, the work of an anonymous writer, from which the extract quoted in a former part of this paper on the above canals was also obtained. After detailing the more ancient conduit, he remarks:

"There are in like manner three other Katuls‡ that are derived from the Tigris by a single source, situate two farsakhs below Samarrah, between Matireh and Bezguara. This portion is called the upper, and

* I have subsequently learnt that the two drains here spoken of, are connected with each other—indeed the latter one appears to have been merely a repair of the old. The bricks are stamped in relief, that is, inversely to the characters found on the Babylonian vestiges, and the legend upon them at once proclaims their Mahomedan manufacture.

† Majin-al-Buldan, under the head of Nahrwan Tamerra, is considered by Yakut as a Syriac term, and would appear to be the name applied to the present Diyaleh, or rather to that portion of it now called the Holwan, extending from the vale of Rijab, at the foot of the Takigerrah pass, as far as Bakuba, and on to the ancient bridge called Jissri Nahrwan only. Diyaleh, I believe, is really applicable only to the part that occupies the space between the Nahrwan and the Tigris, and in the prosperous era of the canal of course was not in existence as a river. The term Diyaleh is perhaps a corrupt form of Dijleh, the name of the Tigris, by the conversion of the j into a y,—a barbarous but not uncommon interchange of letters: indeed, among the tribes located between Bagdad and Basreh, the j is hardly ever sounded in the latter districts. This impure form of speech is inharmonious in the extreme, from its frequency in conversation: it is written, however, Diyala and Diyaleh in the Arabic MS., and therefore deserves consideration as a distinct name.

‡ From the context, this evidently means a single prolonged canal, apportioned into divisions that are named the upper, the middle, and the lower. The Nahrwan will be found in the ancient MS. to be similarly divided, and I suspect the larger canals throughout Babylonia were thus named in the revenue assessments of the country. The source of these is evidently at "Al-Kaim."

from it a canal called Yahudi, having on it a bridge named Kantarot Wasaif, extends into the Katul-al-Kesrawi, a little below Mamuniyeh: the second (Katul) is named Mannini, and is the middle portion. It flows between villages and fields in the tract called Ab-Suad, and falls into the Katul-al-Kesrawi, below the villages of Kanatur, denominated Abu-al-Teyyed. This is the lowest and most considerable, and has well-constructed buildings on its banks. It flows amid cultivations and villages, and in like manner many branches emanating from it, irrigate the country between it and the east bank of the Tigris. These copious branches reach unto the Tigris. The canal then flows onwards to Tafra, and there it is spanned by a bridge of boats; afterwards it joins the Katul-al-Kesrawi, four farsakhs above Sula.*

This portion of Arabia-Irak in its geological features is eminently adapted for canals. The Tigris, breaking through the Hamrin hills in latitude 35° north, continues a course to the S. S. E. for 45 miles, and then turns abruptly to the eastward, in the 34th degree of latitude, along a spur of uplifted silecious conglomerate until it meets with the little stream Atheim, in the neighbourhood of which the tertiary formations of the upper Tigris terminate, and are succeeded by marls and argillaceous plains, which again giving place to humus and various alluvia in the vicinity of Mamuniyeh and Bakuba, extend to the Persian Gulf. The superior portion of the Tigris, extending from the first named latitude as far as Khan Dholoiyeh, is bounded by high cliffs whose elevation is greatest in immediate contiguity to the river, but dip in a E. S. E. direction until met by the South-westerly inclinations from the Hamrin hills. The junction of these opposing declivities forms a gentle but natural valley, conducting from the undulating tertiary beds to the plains. Traces of the last tertiary rock can be distinguished forming a semi-lunar curve from Dholoiyeh eastward to the spot where the Atheim breaks through the hills, its convexity attaining an increased elevation as it approaches the foot of the superior range. Below the curve, however, the elevated lands merge imperceptibly into marl districts, and the natural valley before spoken of, is lost in an easy decline to the South-westward that commences near the hills and terminates in the valley of the Tigris. This vast slope exhibits on its surface contiguous to the range, parallel local elevations alternating with

* The names Mamuniyeh, Kanatir, and Sula, will be found in the description of the Katul-al-Kesrawi.

the plains, that can be followed to the margin of the alluvia, and along the inferior portion of the vast shelf, on the line that divides the marls from the alluvia, conducting from the gentle valley described as formed in the lower tertiary superstratum, is seen the valley of the Nahrwan,* an excavated bed, keeping a general straight line to the south-eastward, indented only according to the almost imperceptible deviations of the boundary of the soils, and to avoid local accidental depressions.

Commencing a little to the S. S. E. of the modern Dur, in a deep but narrow bed cut through the compact but coarse conglomerate bordering the valley of the Tigris, the canal resembles in this its upper course as far south as Samarrah, a precipitous and confined gorge, such as we sometimes see as the effect of earthquakes in rocky and mountainous districts. Unlike, however, to these natural fissures, the traces of artificial labor are observable, not only in the regularity of the walls, but also in the numerous galleries that lead from its bed to the surface of the soil above. With an original depth of probably fifty feet to enable the waters of the Tigris to flow into its channel at the lowest season of the year, the difficulty of raising the excavated earth to the surface of the soil above must have been considerable. The series of galleries, however, though they added to the labour, obviated the difficulty. They are cut through the precipitous scarp at a convenient angle for an easy ascent with a load of the refuse soil, which has been deposited so as to form a protecting bulwark at the edges of the canal. These artificial embankments are now elevated some fifteen feet above the level of the country, and are capable of concealing a vast army secure from the missiles of an enemy, and if acting merely on the defensive, a small force might defy, under cover of the ridge, any power attempting to invade the country protected by the stream. These embankments also served to conduct the rain water collected on the neighbouring land along the canal until convenient openings admitted its mingling with the waters of the Tigris, flowing in the bed of the excavation, while at the same time they prevented a disruption of the scarp by opposing its uncontrolled passage over the cliffs by which the canal is bounded.

* Properly Katul-al-Kesrawi. See concluding sentence of these remarks.

For a distance of ten miles this gorge-like formation continues, when, having attained a decreased elevation and a softer soil, the banks become less precipitous, and are proportionably expanded from a breadth of fifteen yards at the entrance of the canal, to thirty in this vicinity. East of Samarrah, the pebble soil of the surface gradually merges into a marl superstratum, and the canal assumes a less abrupt form of bank with an increasing breadth. Proceeding onwards for a further ten miles, it is evident the general level of the country is attained, and that the bed of the canal must have been on a plane with the surrounding soil, whilst its waters required to be confined by strong upraised embankments. This was its weakest point, for the waters flowing in its channel had not only to be confined, but the banks from without were subjected to the pressure of the collected torrents of winter accumulating in this part from the elevated rocky country to the north and north-east. This is apparent from the present aspect of this portion of the country, and the almost entire obliteration of the canal here has been the consequence of a neglected repair. Deep cracks, that are scarcely fordable in heavy rains, at present cut through the old course of the aqueduct, and at once shew the labour that must have been requisite to maintain its efficiency. In the vicinity of Khan Dholoiyeh, the country again sinks, and the pebbly region is entirely lost. Here the before scarcely traceable outline of the canal becomes well developed, but with a breadth now amounting to 100 yards, and its bed slightly below the level of the plains. This increase of breadth was manifestly demanded to render the canal capable of receiving the winter and spring contributions, themselves forming a considerable body, in addition to the periodical rises of the Tigris at these seasons of the year; and as its waters rolled onwards to Bakuba,* through the loamy and argillaceous formations below the tertiary tracts, we find the bed at the present day averaging a width from 100 to 140 yards, which, when full, must have presented the appearance of a considerable river. The extent of the drainage from the uplands above in this part of its course, is at once seen in the numerous broad and deep beds of torrents,—or "khirrs," as they are termed,—that now find their way into the Tigris. To these were added the waters of the Atheim, which, though

* It should be Baghkuba, for it is written so بغقبا in the old Arab MSS. I have retained the orthography of our present maps, however, for it answers sufficiently well for the present Arab pronunciation and for the identity of the place. It is evidently a word of Persian origin, and is found Arabicised in the more modern MSS. into Bakuba.

a petty rivulet in summer, becomes in the winter months a brawling stream, frequently impassable by caravans. This crossed the course of the Nahrwan, and therefore to prevent injury to the canal by the uncertain shiftings of its stream, it becomes requisite to confine its waters in the hilly regions above. We accordingly see in the remains of a magnificent dam, the energy of a former age, constructed across the gorge in the Hamrin hills through which the Atheim forces itself; the dyke prevented the waters from flowing in their natural channel, and at the same time raised them to a height that permitted their dispersion, through canals skilfully cut on either side of the obstruction, over the elevated country adjoining the dam. These, at present named Nahr Batt and Nahr Rathan, flowed through villages and fields that were dependent on them for existence, onwards in a S. S. W. direction, and finally emptied their superfluous waters into the Nahrwan* itself. The place of confluence of the former is distinctly evident; the latter however is somewhat dubious, and though it is reported to have joined the Nahrwan, I am of opinion that the Nahr Rathan never contributed to the augmentation of its waters, but was entirely absorbed in irrigating the extensive plain of Charfeh, now a desert tract lying between the Atheim, the Khatis canal, and the Dijleh or Tigris. The neighbourhood of the junction of the Batt with the main excavation, is prolific in ruined sites, and otherwise one of great interest; the journal, however, will enter into a further detail.

Immediately below Bakuba, the course of the present Diyaleh turns more to the south, owing to the loam superstratum here taking this direction; and the Nahrwan's bed† is seen also a little east of it, running in a direction parallel to the course of the modern river, which, in ancient times, was either entirely absorbed in the canal, or contributed its superfluous waters only to the general stock. Judging from the smallness of the bed of the ancient stream,‡ and the present magnitude of the Diyaleh, we are surprised at the disparity when we reflect that the Tigris, the Atheim, and the collected winter rains, all furnished to the supply of the canal, in addition to the waters of that stream. The cause is, however, obvious, if we consider the great length of the Nahr-

* Properly Kaiul-al-Kesrawi. See last page of these Preliminary Remarks.

† This is undoubtedly the old bed that the Diyaleh occupied in the early ages, and the same as that mentioned in next page and in the note to page 212.

‡ The Tamerra of the old Arab MSS.

wan, and the number of lateral ducts that emanated like veins from the great artery, a little further to the south. These irrigating an extensive tract of country on either side of the Nahrwan, acted as constant absorbents. We may infer, too, from ancient history, and from the vestiges of canals still seen in the upper course of the Diyaleh, that a small portion only of its waters was allowed to find its way then into the Nahrwan, for it traversed a densely populated territory, whose inhabitants were fully sensible of the value of the element, which must indeed have been carefully distributed by them over the inclined plains that lie extended between the Hamrin hills and the course of the Nahrwan. I am inclined even to the opinion, that the Diyaleh never reached so far as the limit of the canal when this work was designed, but believe that the main object contemplated by the Sassanian kings, was the conducting of a new stream into the Tamerra, or ancient bed of the Diyaleh, which had been dry for ages consequent on an extensive system of irrigation that had been adopted in a remote period ;* and am more confirmed in this view of the case from the circumstance of a portion of the work between Dur and Bakuba exhibiting the decided features of artificial construction evident in continuous straight lines and embankments, elevated considerably above the country, while the course of the ancient bed south of Bakuba is no less decidedly marked by the sinuosities of a natural fluviant as far south as the modern Sifweh. Here, however, it became necessary to turn the direction of the new stream more to the south-eastward, for the fulfilment of the purpose for which it was designed, and to prevent it following its natural course, as it does now, unprofitably into the Tigris. At Sifweh, the boundary of the marls and alluvia is attained, and the line of the varying soils stretches faint to the south-eastward. The designer of the canal evidently well studied his subject, and we accordingly see, at low periods of the Diyaleh, a solid brick structure in the present bed of the river, that obviously gave a new direction to the stream, for it acted as a barrier to its further passage on the line of its old course, and in fact diverted it into its new bed, which, kept just within the inferior margin of the argillaceous tract, was, from its slightly superior elevation to the alluvial district, capable of dispersing its waters over the adjoining country with the least

* The Diyaleh, Holwan, or Tamerra, is generally recognised as the Gyndes of antiquity, and allowing Herodotus's version of the story regarding it to be the true one, the wrath of the great Cyrus would have left but a scanty supply of water in its lower course. See also note to page 242.

amount of manual labor to the cultivator. The nature of the soil, too, admitted of tenaceous embankments, and the lateral ducts extending from the right bank of the stream towards the capital of Ctesephon, shew distinctly enough that here its real usefulness for agricultural purposes commenced. It was here, too, that its name Nahrwan strictly applied only, and the town that bore the name of the canal stood somewhere in the vicinity, either represented at present by the modern title of Sifweh, or more probably by the favorite appellation of Mismai,* now attached to a ruined Sassanian fortress that was doubtless the "keep" of one of the many towns that we know existed on the insulated tract occupied also by the capital.

Though, for reasons that will be given, I have adopted the name of Nahrwan, as it at present exists in the country, for the whole line of canal from Dur to Kut-al-Amareh, in treating of its more ancient history it must be borne in mind that the part S. E. of the Diyaleh is the *true Nahrwan only*. It extended, according to the prevailing traditions, as far as the Persian Gulf, but I do not find any notice in the Arab geographies† of its progress further than Badrai and the Tigris, east of Kut. It is not improbable, indeed, that it had a more extended course, but successive inundations have so levelled the plains to the south, that it appears hopeless to trace its limits any further than the present bed of the Tigris in the neighbourhood of the above places. When a convenient opportunity offers of visiting the disturbed and somewhat dangerous tract of country situated south of the great bend, that the Tigris here makes to the E. N. E., between its old bed at Wasit, and its present course in the Amareh bed, I shall endeavour to give some further account of it. The part, however, that is particularized as the Nahrwan by the geographers, was by the ancient accounts divided in the revenue allotments into distinct districts, termed the upper, middle, and lower Nahrwan‡; and we find these several tracts recorded as forming a part of the country that was allotted by Kesra Anushirwan to the support of his newly created town, built to commemorate his Syrian conquests, and appropriated exclusively for the accommodation of the captives that he had deported from Antioch, then the Christian

* This name, from its constant recurrence in many parts of Arabia-Irak, would appear to have been esteemed by the early Arabs. I do not know, nor can I find, any meaning or etymology for the term.

† There is a canal termed the Nahrban, mentioned as derived from the Tigris, below Wasit, but I believe it has no connection with the Nahrwan under consideration.

‡ Majm-al-Buldan of Yakut.

capital of the east. This city the monarch named Khusru Antakiyeh,* in honor of himself, and in consideration for his Christian prisoners. The city was constructed so as to resemble the Syrian metropolis in its streets, theatres, and public baths, and with an allowance for the usual oriental hyperbole, is represented to have been so skilfully modelled that the captives themselves had no difficulty in recognising their respective homes. As a further comfort, he placed over the town as a Governor, a certain Christian of Ahwaz, that had the confidence of the monarch, in order that the inhabitants of the Christian city might enjoy unmolested the prescribed doctrines of their faith. The identity of its position at the present time is a very doubtful point, and by some its site is thought to be to the west of the Tigris, whereas I think the fact of the Nahrwan districts being accorded to its maintenance, would imply its being founded to the east of the Tigris, and doubtless in the immediate neighbourhood of the canal. I hope at some future time to give a clue to its position, and to many others also, for the alluvial districts watered by the Nahrwan awaken curiosity as to the fate and identity of some of the earliest Christian settlements. The ancient records teem with notices of these Christian colonies,† which, from the tyranny of the age, existed but for brief periods. Meteor-like, indeed, they rose luminous and bright; for a time they spread a light over the darkened land, and the evanescent traces of their career are yet faintly visible in the debased stock that forms the Christian population of Basreh, Baghdad, and Mosul.

The district through which the Katuls and Nahrwan flowed, is now a wilderness, and where erst the "busy hum of men" was heard, at present the silence of the grave predominates. The seemingly arid tract that formerly was a sea of verdure, is untenanted, and, except in the spring season, when nature rejoices for a time in her flowered garb, is untraversed by man or beast: at this time, however, the predatory Arab and the jackal, alike in their pursuits, lurk among the broken mounds for

* It bore also, according to the Kamil of Ibn Athir, the designation of Bumiyeh, or "abode of the Greeks," as a more general term. The Nahrwan then yielded to the state a revenue of £500,000 sterling, or 1,000,000 dinars.—Yakut, under the head of Nahrwan.

† Major Rawlinson's valuable library contains abundant references to these early settlements. They are, however, so varied and diffused, and are written, moreover, in such a *Babel*-like variety of tongues, that few beyond the learned owner have talent enough to extract and compile a history from the chaotic mass. The difficult task he has, however, undertaken, and when complete will doubtless afford to the explorer of these regions a valuable guide to the recovery of lost sites, and to a more perfect knowledge of the comparative geography of this highly interesting country.

the passing caravan that now winds along the bed of the ancient canal, which affords for a month or two a scanty supply of rain-water, and a sufficiency of pasture to induce the owners of the laden beasts to risk their charge by following the line of its course, and thus to shorten the duration of their journey to the city. To others, indeed, the existence of the Nahrwan, although in the immediate vicinity of Baghdad, is scarcely known. The Pashas and Turkish dignitaries frequently cross its bed in ignorance of its name and its purpose, and though that portion S. E. of the Diyaleh is capable of being re-opened so as to receive the contents of that river with but little outlay, we see no attempt made for so desirable an end, though the foundation of the ancient dam still exists, and though the Pashalic has enjoyed a comparative tranquillity for the last thirty years. The baneful system of farming the Governments of the provinces to the highest bidder, is the chief cause of non-progression in the improvements of the country. The Pasha-proprietor knows that he holds his tenure for a stated period only, and considering he has paid for his "whistle," he is hardly wrong in trying to extract from it as much as he can without any additional outlay. Oppression, and every other nefarious artifice, is resorted to to swell the revenue for the time being, which, not being state-property, is greedily gathered by the farmer, whose time is entirely spent in contemplating the probable amount he can squeeze from the country previous to the arrival of a successor, who, by a more liberal offer in the next state auction, is enabled to thrust the occupant from his seat, and comes armed with new devices and a rapacious greed to exact an usurious return for his purchase-money. From the rapacity of these unblushing ministers, the troops are kept also in arrears for a period sometimes amounting to as much as nine or ten months, and a threatened mutiny then succeeds so far as to obtain for them one month's pay in the four, and this is raised not without every device being practised to shew the poverty of the treasury by obtaining loans from merchants at a convenient interest, although each month witnesses a valuable freight of gold on its way to the private banker or agent of the minister residing at Constantinople. The country is thus constantly impoverished, and unless a less selfish policy be promptly adopted, by the appointment of some patriotic Pasha to the office, it will soon be destroyed; for in addition to the evils I have enumerated, the rivers and canals, uncontrolled and unrepaired, are committing annually such ravages that a profuse expenditure will not re-

deem,* and moreover, the fine and classic streams themselves are becoming every day less navigable from their having found so many outlets in their lower course. These now receive the greater portion of the current, and new deposits are thus constantly forming in the old channels that threaten to obliterate their ancient beds, and unfortunately for Turkey, the Tigris's new direction tends towards the Persian territory, while the destruction of the lower course of the Euphrates has converted the rich Ottoman lands on either side of it into impassable and pestilential marshes. I am, however, wandering from my subject, but in contemplating the decay of the magnificent canals that I have traversed, the mind will revert to the general wreck that is with rapid strides still advancing on the region endeared to the traveller and the historian. That it is near at hand, no one will doubt that has witnessed the deplorable state of the Tigris and Euphrates in their lower course at the present day. Until recently the tribes were compelled to keep the waters within their due bounds, but the neglect of the last few years, coupled with the inordinate desire for riches in the local governor and his subordinates, has given the uncontrolled waters a liberty they are fast availing themselves of, to the destruction of their navigability, and the disruption of the adjoining land: in fact, if matters are allowed to take their course by a further period of inactivity, we may look forward to the speedy fulfilment of the prophecy which, indeed, so far as the Euphrates is concerned, may be said to have been already verified; for that noble river is converted into "pools of water," it being navigable for boats between Suk-i-Sheyukh and Basreh, during the spring season of the year only; while the Tigris, the single high road now open for the introduction of our Indian commerce, is fast advancing to the same state of degradation.

The foregoing remarks will convey but a vague historical view of the territory of the Nahrwan, and the once flourishing canal itself. A greater interest will perhaps be excited by a perusal of its present aspect from notes connected with my operations on the line of its course. I therefore append the journal of my several visits, together with a map constructed from the numerous observations made along

* Notwithstanding the improved condition of the Turkish regular army, it is lamentable to record that in the numerous bodies that have lately visited this part of the empire, not a single engineer officer is found capable of conducting the most simple part of the duty of his profession, and civil engineers, for the superintendence of the erection of dams in a country so much requiring them, are deemed altogether both superfluous and expensive.

its deserted track. These, both astronomical and geodætical, it is hoped, will fill a gap in the large tract of our geographical uncertainty. It must be borne in mind, however, the name Nahrwan, both in the journal and in these preliminary notes—except when treating of its more ancient appellations, has reference to the whole line of canal from Dur on the upper, to Katul-Amareh on the lower Tigris; for in the present day its ancient names of Katul-al-Kesrawi and Tamerra, have been lost in the more general appellation of Nahrwan, and I have accordingly adopted the term—though an erroneous one—to prevent the confusion that would arise from a frequent repetition of the old name of Katul, since it has been usurped by the more modern work that will require mention also. Where this term is used it distinctly applies to the south canal, and is written simply Katul, without the royal title "al Kesrawi. In the map, however, they are represented by the true names.

(Signed) FELIX JONES, *Commander, I. N.*

Narrative of a Journey undertaken for determining the Track of the Ancient Nahrwan Canal.

I had long been desirous of ascertaining the true course of this gigantic work, which tradition, and history, but vaguely assign to the wisdom of the Sassanian kings of Persia. The state of the tribes contiguous to its deserted track, the want of water in the regions that it formerly so abundantly supplied, and other avocations, however, prevented me visiting it until the spring of 1848; when circumstances permitted me absenting myself for a short time. In April, therefore, I took advantage of a period of tranquillity among the Arab tribes, who had been temporarily drawn from the South into the neighbourhood of Baghdad to suit some design of the Turkish Government, and had left the districts S. E. of the Diyaleh, as far as Kutal Amareh, an unpeopled wild. This in many respects was a fitting moment to visit the interior, and having made arrangements with my friend Sheikh Subba, the chief of the latter hamlet, who had previously learnt that we might count upon obtaining water in the bed of the old canal, commenced my journey.

The party consisted of Sheikh Subba, a holy but ragged Syed from Dahliyeh, with whom I had made a tolerable acquaintance, and who would not suffer me to go without him,—his sanctity being required to protect me as he stated, though I was fully aware his chief considerations were a desire to share in the dates and tobacco that I had provided for the party on the journey, and to remain as my guest so long as it should be convenient for him to remain in Baghdad. These two acted as guides, and with two Turkish guards, a servant, a tent-pitcher, and two Arabs of Kut for the care of the cattle, besides myself, the number was made up to nine. At Kut I hired animals for the party, as well as to carry a small tent, the provisions and some water skins; for, until we reached the Nahrwan, it was certain that no water existed between the Tigris and the streams emanating from the hills in the neighbourhood of Mendalli. We were all armed sufficiently well to oppose any small predatory parties we might meet, and in addition to a double barrelled pistol, I carried in my belt a prismatic compass, by Troughton, and a chronometer, a sextant, and artificial horizon, were conveniently stowed, to escape observation, on either side of the saddle of the broadest member of the party, whose loose and ample dress in a great measure concealed them from a too prying curiosity. A Schmalcalder's repeating Theodolite lay snug in the folds of the bechoba tent, and its tripod was so arranged among the sticks as to be deemed a part of its appendages.

For the purpose of discovering any traces of the Nahrwan, or of its branches, which the ancient Geographers relate extended to the Tigris below Badrai, I determined on crossing a part of the solitude towards the modern village of Jessan in a direction North from Kutal Amareh, especially as Sheikh Subba had previously informed me that a few faint lines could still be traced in the intervening country. I accordingly left Kut at 1h. 10m. chronometer time* in a direction of 327°. At a distance of 100 yards only from the Tigris the most desolate wilderness is at once entered, and the fact of the presence of the broad and rapid river within a stone's throw of one, is, as it were, a dream. No natural ver-

* April 21st. As I could not well carry a watch in addition to the Chronometer, the latter's times are given throughout the journal. These have no reference whatever to the real time of the day, but are merely here given for obtaining approximate distances by the employment of the intervals.

The chronometer was, however, slow of the mean time at Kutal Amareh on the previous day, a quantity of 4h. 46m. 1s. 4t., and its daily rate of gain was 10s. 8t. in the interval of absence on the journey : the true diurnal periods are therefore easily ascertained.

dure or cultivation marks the element so close at hand, though a progress of a mile and a half places the traveller on a spot radiating with lines that were formerly copiously filled from the great reservoir by the energy of the dispersed races that occupied the territory. The comparison, indeed, between fertility and barrenness, between modern apathy and the laborious vigor of a prior age, is nowhere, I believe, so well marked on the map of nature as it is near Kutal Amareh. At the spot alluded to, which I reached at 1h. 45m., a long canal coming from a due north direction (probably connected with the Gathir al Rishadeh prolongation, which I shall subsequently speak of) meets another canal running at right angles with it from the Tigris on the west of Kutal Amareh directly across the peninsula and joining the Tigris again to the East of the village, where its banks have been broken through by the river since it left the old bed near Wasit and occupied its present course.* The spot at which these canals cross each other is also marked by a high mound called "Ishain-al-Kut,"† doubtless covering the remains of some large edifice that stood at the confluence of the streams, and the thickly scattered fragments of brick and pottery shew that a considerable village occupied the site also. The canals are at present called Khiyut-al-Kut,‡ and a branch can be faintly traced leading towards the modern village. My friend Sheikh Subba was particularly enthusiastic in his topographical description of the locality, and affirmed with an oath that the patriarch Abraham resided at the spot; and moreover pointed out even where he had constructed his "Sirdab" or summer apartment. Such is, however, the tradition of the country, and some similar tale will be found attached to nearly every petty mound that the traveller passes. They serve well enough to amuse the monotonous hours spent upon horseback, but are worthy of no credence whatever.

Leaving the mounds at 1h. 50m., a course of 260° was pursued to the East bank of Tigris, which was reached in 40 minutes. Here I came upon the line of another ancient canal coming from a direction of 310°, and broken by the Tigris at this embayment of the river. Keeping in the canal on a line with the above bearing, for ten minutes, its direction

* I believe the elevated mounds of this canal to be connected with the high mounds termed "Al-Sinn," now on the west or opposite bank of the river, but I must leave this for subsequent verification.

† This is a patois of the Kut territory for Nishan-al-Kut. The term signifies "Index or Landmark of Kut."

‡ Khayt خيط in the Arabic properly signifies "a thread," but is applied also to any extended lines, such as walls or banks of canals.—"Khiyut" is here used as the plural.

altered to 277° with well defined banks and a bed of 30 yards in breadth. At 3 h. a branch was passed, taking a course of 207°, apparently in a direct line through the alluvial peninsula formed by the curves of the Tigris. From this the line of the original canal again resumed its course of 300°. In half an hour an offshoot was passed extending on a bearing of 60°, and at 3 h. 55 m., all further traces were swept away by the encroachment of the Tigris which is now close to. Suspecting, from the direction of the bank of the River, that the canal would again be met with at no great distance, the Tigris was skirted as far as the ruins of Jumbil. This I reached at 4 h. 50 m. A considerable town flourished here in ancient times on the left bank of the Tigris, and so late as fifteen years ago some portion of its ruins were to be seen on the bank. Since then, however, the ravages of the stream have swept these vestiges away, and nothing but a mass of brickwork, part of a very solid structure, remains to point out the locality. This is to be seen only at intervals during the season of the year, and is, indeed, more often buried in the body of an island formed by the deposits after the spring rises.* About a mile to the west of the site of the town, however, the canals are again met with, and at a point of confluence I observed that one branch led towards the lost city, and its opposite portion appeared to extend to the Tigris in a W. b. N. direction, while a lateral duct, extending in a line of 197°, watered the peninsula formed between the bends of the Tigris to the south. These canals would also appear to have been dependant for their supply from a larger conduit situate on the somewhat more elevated land adjoining the position of Jumbil, for two feeders, running parallel to each other and coming from a direction of 13°, are evidence in favor of it, and I accordingly presume that a large canal, marked on the map as the Shaour, was the line from whence these derived their supply in the flourishing period of the Nahrwan.

Yakut, in his epitome, relates, that when the Tigris first changed it course from the Amareh to the Wasit bed, the lower part of the Nahrwan became choked, so that its waters were either forced or were conducted into the Tigris somewhere in the neighbourhood of Jumbil,† and that subsequently to this, owing to further obstructions‡ in the upper

* The ruin is now visible in the centre of the river. Sept., 1849.

† In the Arab MS. the name of this town is Jebel. The modern Arabs have converted it into Jumbil, but there is no question of the identity of the place.

‡ Evidently alluding to the progressive decay from the constant wars, and neglected repairs, mentioned in the preliminary part of this paper.

part of the Nahrwan's course, it failed in reaching even this point, and that eventually it was carried into the Tigris in the vicinity of Jarjaraiyeh.

Above Jarjaraiyeh no considerable part of the Nahrwan ever reached the Tigris. The remnants, indeed, yet tell us there was an extensive system of irrigation pursued even at this distance from the Capital, but it is now almost impossible to give a defined shape to the lines of these aqueducts, which in the vicinity of the Tigris, traverse each other in a multitude of fantastic ways ; and with a little repair might again serve the purposes for which they were originally designed : or, as a thought struck me, filled up and raised considerably above the level plains adjoining them, their beds would answer admirably well for rail-road embankments ; and indeed, with a careful levelling, were the soil a little more hard, would be found well enough adapted as viaducts for engines in their present state.

After finishing my observations on the canals in the vicinity, I left Jumbil and returned again to Kut-al-Amareh by the same road, in order to follow up on the morrow the examination of the canal coming from the North towards the Nishan-al-Kut. In many places adjacent to the river, the country was covered with a rich carpet of grass. This verdure is, however, but partial, for there is evidently much nitre in the soil, as is generally the case in the vicinity of ancient sites. In the neighbourhood of old and densely populated cities, the abundance is very striking. The prettier spots of green, enamelled as they were with a variety of flowers, exhilarated the Arabs of the party, and called from them comparisons disparaging to town-life, by no means agreeable to the more grave citizens that accompanied me. Though fast waning in years. Sheikh Subba enlarged upon the blessings of polygamy, a green sward, and the pure desert air. Already in the possession of the full measure of his happiness in the first respect as allowed him by the Koran, he could not help, in the exuberance of his spirits, confiding to me the secret of his being in love with a young maiden, whose tribe was encamped near to Jumbil, and whom he had hoped to see filling the family water-skins on the bank of the river. The old sinner was, however, disappointed on this occasion, and sank into silence as we approached the tents in which three of the matrons whom he had espoused held their court. Reflecting on the scene that would attend his declaration of divorce, he reined up his steed to a walking pace, and proceeded

onwards in a moody humour, far different to that of the previous half hour. On reaching the capacious tent of the Sheikh, we found a goodly assembly of the tribe and visitors that were guests for the evening, for this is the general halting place for travellers on the way from Suki Sheukh and Basreh to Baghdad. The embers of three fires that occupied the centre of the tent, surmounted as they were by some huge coffee-pots, bespoke the nature of the beverage that was preparing for the collected circle around. A greasy carpet that had served the "lion"* and his ancestors for many a day, with a befitting pillow, heir-looms of the family, were placed against the pole at the head of the tent. These were occupied by the Sheik and myself, and after the usual salutations, the conversation turned upon the state of the country, the government, and the crops,—the usual themes of Arab conclaves. They, one and all, complain aloud of the parsimony of the present Pasha, and the rapacity of his agents, which indeed is the chief topic heard from the Persian Gulf to Mosul.

Finding I could elicit no true information of interest on the subjects of the canals,† I took leave of the assembly, and spread my carpet at a distance on the bank of the river, where, unmolested, I obtained some good observations of *a* Canis Majoris, (Sirius) for testing the performance of my travelling chronometer. The attacks of mosquitoes throughout the night were terrific, and sleep, though so much needed, absent from every one of the party.

The following morning at daybreak we were again in full march. The appearance of our nags was, however very dispiriting, for, like Pharoah's lean kine, they displayed more rib than flesh—and indeed, more bone than sinew : yesterday's short journey had awakened me to the discomforts in store travelling on such jaded beasts, but complaint was

* The nomenclature in Arab families is sometimes very remarkable, and is the more surprising when we witness a complete generation named after members of the brute creation, particular species of which are held by them in abhorrence, and are pronounced as unclean by the Koran. For instance, my friend the chief is named Subba, or "lion ;" his father was Khanzir, or the "pig;" and Dhubba, "the hyena," was the title of his grandfather. He had, besides, two uncles named respectively Dhib, "the wolf," and Bazuneh, "the cat," so that, when congregated together under one tent, they must have formed a respectable menagerie. The present Sheikh, however, having attained to the majestic title at the head of the list, is disinclined to descend again in the scale, and has wisely given to his son the name of Mahomed, which, according to their ideas, pertained to the best and the most holy of the human race.

† The endeavour to obtain authentic information of any kind, relative to the occurrences and events of the present age, from the Arab tribes, is almost an idle and hopeless task. With antiquarian lore they are quite unacquainted, or so mixed is the tale obtained from them with local and frivolous traditions, that for critical research it is in most instances quite valueless to the geographer.

useless, for better were not obtainable, and thus consoling ourselves, we jogged along at a tortoise pace to the Nishan-al-Kut mounds. Quitting these at 1h. 15m. C. T., we rode along the line of a canal that trends due North; but at a distance of two miles from the station we left, its further traces are lost in a boundless flat, evidently frequently submerged. Its aspect, indeed, bespeaks it as the limit of the bed of a vast lake, and the absence of all vegetation on the dreary waste, covered as it is with an efflorescent salt, renders its expanse very painful to the eye. Neither road nor foot track relieves its monotony, and except in the tiny imprints of the antelopes' hoof, can we connect it with the abode of animated life. We, however, pushed along in a direction of true North, and at five miles distance from our starting point, we crossed the faint lines of an ancient canal, discernible only by the deep straight line of its bed being filled with rushes, and a thorny shrub with a dark green leaf that I afterwards found was peculiar to old water channels.

The remnants of this canal, called now Ghathir-al-Reshadeh, extend to the north-westward in a line of 329°; to the S. E. they bisect 110°. it is said to fall into the Tigris by the outlets of the marsh termed Um'l Khanzir, a little to the north-westward of the ruined enclosure of Hasseyn Khan Faili.

After a ten minutes' delay for the bearings, we resumed our course as before, and so long as the bushes on the Ghathir-al-Reshadeh were in sight, we were enabled to judge of our line of direction correctly enough. This was 355°. These marks, however, were soon lost to view, and the soil becoming more humid and soft, compelled us to deviate occasionally. At the twelfth mile of our progress, a swamp, called Suweycheh, or Bahri Ruz, with a small rill of clear salt-water running through it to the S. E., obstructed our direct passage, and obliged us to make a detour. Here our beasts failed us, for they had not strength to carry anything beyond their own carcasses through a marsh like this. By wading and supporting the weak, however, with the theodolite tripod placed under the stomach, we managed, after a hard struggle, to clear the marshy tract, but not without abandoning a couple of the miserable animals in the middle of it. The day was calm, and the sun insupportably hot, with a glare from the salt exudations quite distressing. Our skins of water had been exhausted in trying to refresh the worn-out cattle so as to give them more strength for struggling with the mud, and we now felt the want of the precious element ourselves.

To add to our mortification, the country on the other side of the salt stream did not improve, but bore the traces of recent submersion, and the superstratum of the soil though harsh, dry, and crackling, broke beneath the horses' feet, and exposed an under surface of a black and tenacious morass, so harassing to the poor beasts that the riders were frequently compelled to dismount. Thirsty and fatigued, we continued to struggle onwards in a more N. Ely. direction, having faint hopes of meeting some drinkable rain-water in the Mari canal. As the day advanced, however, the heat became more oppressive, and the strong of the party, finding it useless to wait upon the weaker beasts, pushed on over the desolate tract, leaving them to follow at their leisure on the foot-marks of the more advanced. As they dropped one by one, I despaired of seeing them again, but it seems the Arabs were more confident, and left them lying with their loads on, in their muddy beds, until they should recover strength enough to pursue the journey. At 9h. 10m., to my great relief we gained the ancient bed of the Mari canal, but alas! there was no water. This was distressing, and I was urged by Sheikh Subba to proceed onwards at once to the Jessan stream, named by the Arabs the Chakha—a further distance of two hours. As I had, however, come through the sterile wild merely to ascertain the position of this canal, I would not move further,—but, spreading my carpet in the green bed of the Mari, desired the Arabs to leave the baggage, and proceed onwards to water the cattle, and return to me with a supply in the skins. This they did, and I was left alone until they returned. I occupied the time, however, in taking double altitudes for latitude and longitude, and in the evening I procured a meridian altitude of α Ursæ Majoris (Dubhe.) These gave its position as 32° 51′ 07″ N., and in meridional distance 3′ 36″ east of Kut-al-Amareh.

A line of oases is all that is left to mark the site of this canal, which the Arabs state, from traditional hearsay, to have been formerly a magnificent stream. Its bed is but faintly marked indeed for a canal, but to those accustomed to their traces, the verdure in the elevated bed sufficiently identifies its purpose, even did the straightness of its course not proclaim it as a lost branch of some great aqueduct, which, though since surrounded by salt streams that have undermined and swept away its banks, exhibits, as the Arabs say, a perennial vegetation,—caused, I imagine, by its slightly superior elevation placing it out of the influence of the saline taint. While all around, as far as the eye can

penetrate, is a wilderness of salt incrustations, it is refreshing to be seated on a rich sward of a few yards in breadth only, intermingled with flowers, and the taller ever-greens that I have mentioned as peculiar to old water channels: nor, unless it be occasioned by the elevated ridge of the old course absorbing the copious dews which hover over salt tracts, can I ascribe a cause to such a phenomenon in nature. Doubtless, in the heavy rains of winter, the hollows collect a great quantity of water, which they retain, from the greater specific gravity of the salt fluid of the adjoining lakes not allowing the lighter body to percolate. This is maintained in the line of the canal probably, and, in connection with the dews, may account for the abundant verdure. As tradition has it, a large town formerly existed in the neighbourhood of the canal, whose people indeed ruled over the whole of the contiguous territory. They were subjugated by one Mehdi, who is represented not only as a powerful chief,* but as a proprietor of vast herds of cattle. This personage, as the story goes, came from the south, and finding the Mari people frustrated his attempts to take the city, he conceived the design of cutting off the supply of water from the inhabitants. This he effected by the destruction of the present canal, and the town, as a matter of course, soon afterwards surrendered. The victor wreaked his vengeance on the brave inhabitants by cutting their throats in cold blood, and by razing the city itself. The present and neighbouring town of Jessan, is said to have arisen some centuries ago on the ruins of Mari, and the descendants of its ill-fated people are even distinguished at this day as the "Ahl-al-Mari," or the "Mari family," among the inhabitants of Badrai and Jessan. The older houses, too, in Jessan, are said still to bear in their construction the trees that were removed from the Mari† gardens.

The direction the canal takes to the West is 285°, and to the East 65°; the latter bearing would induce me to believe that it derived its water from the present Jessan stream, while the former evidently points to the Nahrwan. It is, however, idle speculating on the small traces that are left, for the almost annual submersion of the country in later times has swept away all further signs whereby it might be identified.

* Probably a chieftain of the early Beni-Lam settlers. The tribe is supposed to have occupied its present territory, between Kut-al-Amareh and Hawiza, about four centuries.

† Mari مري is a name in common use for canals, and signifies flowing.

The absence of fresh water, as I stated before, compelled me to despatch the cattle to the Jessan stream, named by the party the Chakha: nor did they rejoin me until late, and then the extension of their journey after the day's fatigues had so exhausted them, that no pains were taken to tether the animals for the night. The men, too, were as fatigued as the cattle, and it was with no little surprise, on waking the following dawn, I observed not a single beast in sight. The Arabs for once had been caught napping, and now hurried off, a little abashed at their unusual neglect, in search of the missing animals. The increasing light, however, discovered them scattered in every direction, at a distance on the plain, nor did we recover the whole until after much time had been lost. A beautifully clear morning enabled me in the mean time to distinguish the town of Jessan, refracted considerably above the horizon. Its bearing was 40°, and I estimated its distance as nine geographical miles. Badrai, too, was pointed out in a direction of 30°, and a place of Ziaret,* termed Imam Suliman, surrounded by a few date trees, bore 16½°; while the high brow on the western range of the Luristan mountains, immediately north of Ali Ghurbi, on the Tigris, bisected 82½° of the prismatic compass. The Imam may be 7½ miles distant. The dategroves of Badrai and Jessan were very plain to the eye, though at sunset the preceding evening I could not discern them with a glass.

At 12h. 35m. C. T. we again bestrode the miserable animals on our return to the Tigris. The beasts abandoned yesterday had, with the exception of one that had died, rejoined us before mid-night the evening before, with the load of the defunct one distributed among them. From the looks of these, thirsty as they are, it is evident a long walk is in prospect for some of the party. Having afforded the worst a little water from the replenished skins, the march was commenced in a general, but by no means straight, direction of S. W. by W., over a plain bearing the same features as I have described. As the sun rose, the heat became scarcely bearable, for the day was calm, and the tract passed over more efflorescent with salt than that of yesterday. The glare and heat reflected back from this was instense, and the water-skins were frequently sought. At six miles from our encamping ground, the

* زيارة Ziaret is a place of pilgrimage. The tombs of holy and revered men are thus named among the Mahomedans.

salt stream in the bed of the Suweyiheh lake again became the scene of distress to our miserable animals, who, for a greater relief, and to enable them to pass the morass, were eased of their human freight, and managed thus to flounder through the swamp, supported on either side by men, with a tolerable celerity. Having reached the other side, it was evident the beasts that had suffered yesterday, and from their crippled state had not gone on to the water, were failing fast. A halt was, therefore, called for half an hour, in hopes of its refreshing them, though we had a long pull yet before us to the Tigris, and the skins were already exhibiting a most emaciated appearance under the exhausting applications that had been made upon them. The excessive heat, and the knowledge that little water existed, I believe made every one more alive to thirst, and the dread of not getting a fair share of the fluid was the occasion of more frequent demands upon it. To my mortification the boiled fowls I had with me, from being confined in saddle-bags under a thermometer of 120°, had obtained that piquant flavor so admired by the vulture and the jackal, and I was compelled in consequence to make the morning's meal off a cube of salt-beef, that, in addition to its edibleness, answered equally well the purposes of a seat or a pillow. The repast was refreshing enough, but it required the last drainings of the skins to alleviate the craving that followed from indulging in it, and from exposure to the heat also. By the time we resumed our route not a drop remained to us, and the halt, instead of refreshing the beasts, as I thought, only added to their weakness, for those that had lain down, from their stiffened limbs could not get up again without help, nor could they proceed at the pace we had been going at. An hour's tedious way-faring over the incrusted plain, indeed, caused a separation of a mile between the van and the rear, so eager were the strong to reach the water, which Sheikh Subba declared would be found in the bed of an ancient canal some hours before we could reach the river. I found the straggling principally caused by a horse that was in the last agonies, yet endeavouring to follow. He was abandoned, therefore, after being released of his light load—the empty water-skins. His owner, however, determined to await his recovery or death a reasonable time, and then to push on after the party. The whole plain was now literally alive with antelope, and when first seen caused us some alarm, for the mirage hovering on the salt-tract had transformed them in their gambols into troops of desert banditti. One time the

deception was so great that we drew up the party, convinced that a large body of Beni-Lam horsemen were in pursuit of us on the south-eastern horizon. This salt-marsh is a favorite haunt of these timid animals, who require but little water, and prefer even that in a brackish state.

At 7h. we could just discern signs of verdure to the S. W., and on Subba declaring it was the spot he had no doubt of finding water in, there was a scramble who should first partake of it. In a quarter of an hour more the bed of an ancient canal was gained, but the hopes held out to us vanished in a trice, for not a fluid drop remained in it, though certainly from its appearance it must have been wet a couple of days back. There was no help for it, and as the men could hold out until they reached the Tigris, I halted here so as to enable the worn-out beasts to enjoy the rich grass that was growing abundantly in the bed of the old watercourse. The owner of the abandoned horse joined us soon after, with a most pitiable tale of his blighted fortunes consequent on the death of the poor beast.

This ancient remnant is a bed of forty yards in breadth, confined between well-marked mounds that could be faintly seen coming from the north-westward. It is now named Mokta-al-Subba, or the "lion's cut," and is said to be infested at times by these animals, which is probably the case, as they abound on the banks of the Tigris in the immediate vicinity. I am inclined to the opinion that this is the continuation of the Nahrwan, and though but a small portion is left as a guide for argument, it is seemingly the position from whence the *Jumbil* canals and town derived their supply of water, for the bed, in an easy curve, changes from N. W. to S. W., and this is in accordance with the description the Arab writers give of its course subsequently to the decay of the portion to the S. E. of the town of Jumbil.

At 10h. 20m. C. T. the route was again resumed, the men now suffering from the heat and thirst, though the horses were much enlivened from partaking of the rich pasture in the bed of the Mokta-al-Subba, and paced along with renewed vigor. The "lion" now comes in for a plentiful share of the ill-feelings of the party for holding out hopes that were deceptive. All declare now that had he expressed a doubt of the existence of water, a greater economy would have been observed. Of this, however, I am doubtful, for indeed I urged the necessity of pre-

serving a portion, but unless I had taken the skins on my own horse I knew it would be unheeded. Sheikh Subba under the attack preserved a dignified silence, merely observing, occasionally, that there was no want of water in the direction we were going, and that the clamorous might go there with all speed, or to another place more congenial to the warmth and impatience of their temper.

While proceeding along in no very good mood, we were suddenly called upon to witness a barbarous custom in vogue among the Arabs everywhere, but one which I had never been present at before. My sanctified friend of the green turban and rags bestrode a mare of his own that had lately been in season, and since her feed in the Mokta-al-Subba had evinced skittishness that troubled the Syed exceedingly. To my annoyance he would insist on dismounting, which he did, and after an examination, he declared that the lean and jaded creature had "taken the wind," meaning by this, that some evil blast had passed "per vaginum" into the uterus of the animal. There was only one remedy of course, and this was passing sutures through the parts to prevent the foal from being subject to bad influences that might affect its future career. I tried to laugh the brutes out of their absurd ideas, but might as well have urged the necessity of celibacy, for I obtained but a contemptuous glance condemnatory of my ignorance in such affairs, and the work was proceeded with. The poor mare, after being hobbled, was thrown down, and the ragged descendant of the holy tribe undertook the operation, which he effected by the aid of a large pack-needle, and a twine made out of rough goat's-hair. The torture the poor animal underwent was considerable from the size and bluntness of the needle, but it was at last effected, and with a copious volley of "l'Amet Allahs"* showered on the head of the beast, she was allowed to rise. The belief and custom is universally prevalent, and I am told that a parent would rather that his child came under the influence of the "evil eye," than suffer his mare to contract a noisome taint, which they believe is communicated in this peculiar way by an insidious wind that, like electricity, passes rapidly by at times.

After this annoying detention, we progressed onwards more rapidly over firmer ground than the heavy salt loam, humid as it was, that we

* An Arab imprecation, the most common in use perhaps among all classes of the people. Children that have just attained speech are adepts in the application of the phrases, which signify "the curse of God."

had traversed the whole morning. We now went W. S. W. over a desert of fine soil capable of cultivation, and at 11h. 7m. C. T. we discerned the well-known enclosure of Sheikh Jaad, bearing 230°, distant about eight miles,—and in another forty minutes, to our great relief we issued from the most barren wild that perhaps the eye ever contemplated, into the richest verdure that nature is capable of producing in a prolific spring. Here we halted on the borders of a vast marsh, formed by the Tigris breaking through its east bank in the neighbourhood of Kaleh Jaad, which bears now 220°. Men and animals now made one rush for the water, the first draught of which amply repaid all our past troubles, and in the enjoyment of it the necessity we had labored under was soon forgotten. It is quite certain, however, from these two days' journey, that unless the Ghathir-al-Reshadeh and the Mokta-al-Subba be remnants of the Nahrwan, no traces of it are now to be found between the village of Jessan and the Tigris south of Jarjariyeh. The whole of the interesting space has been submerged at various times, and these inundations have levelled every eminence that may have existed.

At sunset* I obtained the sun's amplitude as 287° 45′ for variation of the needle,† and the meridian altitude of *α* Ursæ Majoris gave the latitude as 32° 39′ 7″ N. This, with the true bearing of Kaleh Jaad, fixes my position.

Notwthstanding our present conforts of abundance of water, a fine rich sward for a bed, and the clear canopy of heaven for a coverlid, we are not without our annoyances. The mosquitoes, indeed, forbid sleep after our fatigues, and we rise accordingly with the dawn but little refreshed, and with plenty of occupation for our hands. When well light (C. T. 11h. 32m.) the carpet was exchanged for the saddle. From this time until 1h. 30m. we kept in a direction of North on the skirts of the marsh, but finding that it extended at this time further to the East, to prevent the long detour we determined on fording it. It was accomplished at a snail's pace, but not without two horses falling into it, and the rest extricated themselves with some difficulty. The marsh abounds in wild boar and ducks, and though so late in the season, a couple of snipe were sprung. The "grisly grey monster," in the security of his muddy position, allowed us to pass unheeded, and, indeed, had

* April 23d. † It is here 4·2 West.

we met him on the plain, our miserable animals would have had as much chance in the chase as a Dutch brig in pursuit of a crack frigate.

Emerging from the marsh, which had occupied half an hour in crossing, the following bearings were obtained:—Kaleh Sheikh Jaad 182°, and the ancient mound occupying the site of Naaman on the right bank of the Tigris, above Baghilah, 224¾°. We kept a direction now of 275°, having a line of mounds, named Shaour, running nearly parallel with our course at a mile's distance on our right. This is a lateral duct emanating from the Nahrwan immediately north of Jarjariyeh ruins. At 11h. 45m. I called a halt to allow of the party closing, as the worst animals had begun to flag again, and were now a long distance behind. In this way I do not think our pace exceeds 2½ miles per hour. The Shaour mounds are now 1½ miles distant to our right. While the party was closing, the "Lion" drew his sword, and, in the exuberance of his spirits, though on a most sorry nag, went through the manage with skill and dexterity, much to the chagrin of Syed Mahassin, whose tattered garments and want of a weapon compelled him to seek solace in the "Sibeel"* or short pipe of the Arabs. He thought it, however, a good opportunity to indulge in his favorite theme of disgusting flattery and proffers of everlasting service, which is the repulsive point in the otherwise frank character of the Arab; but, alike deaf to my own accomplishments, and the necessity for his friendship, poured forth in the most whining and abject tone, I did not return him an answer. Yet this begging and fulsome rascal is as proud as Lucifer, and would deem it an indignity scarcely atoned for by blood, were he desired to betake himself off from the carpet which he certainly contaminates. It is very trying to one's temper, but ebullitions of passion answer no good purpose, and after all, I find it is the best plan to persevere in a good-humoured silence until such creatures as these have expended themselves, when a well-turned joke, or an allusion to his graceful appearance on horseback (for the Arab must be fought with his own weapons,) will generally put the subject, that of endeavouring to obtain as much as he can, out of his head for the time.

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* سبيل literally means "a road," and is a name especially applied to travellers,—and the pipe made of clay in use by them and by the lower orders of the people. Its bowl and mouthpiece are at right angles from each other, and are similar in appearance. It is a convenient appendage for a smoker on a journey, as it occupies no space, and is used without the long stick attached to most Turkish pipes.

At 3h. 5m. C. T. the party had passed, and we, therefore, resumed our route. At 4h. a low mound covered with brick, pottery and scoria, bore evidence that a building of some extent formerly occupied this locality; and, indeed, on a further examination, I could trace that a considerable town at one time surrounded the conical pile. The enclosure of Masaihiyat bore 189°. Kept on the same course of 275 to 280°, and at 4h. 30m. reached an old bed of a stream now termed Abu Chellach,* which leads into the Tigris on the East side of Debuni peninsula, about 600 yards distant from our present position. I have not the least doubt but this is the point where the Nahrwan joined the Tigris in its days of decay. The Arab geographers name the neighbourhood of Jarjariyeh as its point of termination, after the country had been destroyed by the Seljuks, and after the canal itself, from stoppages in its upper course, had ceased to flow as far South as Jumbil. Like an expiring mortal, indeed, we see its extremities first wasted by the blasting touch of decay,—the limbs then have lost their vigor and freshness, and finally, the inanimate trunk itself is all that is left for us to gaze at. This is a true picture of the Nahrwan. We have seen in the Ghathir-al-Reshadeh, in the Mokta-al-Subba, and in the broken aqueducts surrounding Jumbil and Kut-al-Amareh, the faint but first effects of its decline. As we have progressed, the more distinct elevations forming the banks of the Shaour and the Debuni canal, both lateral ducts from the main stream, bring us as it were to the second stage; and at Abu Chellach or Kellek we arrive at the prostrate trunk itself, whose continuity we behold stretching far to the N. W., with its numerous arms uselessly extended on either side of the giant body from which they formerly derived their nourishment.

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* I have given the orthography of this term according to the corrupted pronunciation in vogue among the Arabs of my party. It properly is ابو كلك—Abu Kelleck, or "Father of Rafts," and the name would imply that it was navigated by these contrivances in the period of its prosperity. At the present time rafts never venture below Bagdad on the Tigris, from fear of the Arabs; and the only exception to this was the conveying of the Assyrian antiquities discovered at Nimrod, in this primitive manner from Bagdad to Basreh,—where, by the bye, the magnificent bulls but ill fulfil their trust as guardians to the entrance of the proud temple of Assyria—for for the last three years they have lain recumbent, apparently uncared for, on the mud flats North of the dirty town. These noble specimens should have graced England's museum at least two years ago. But I am wandering from my subject in regret for the distaste evinced by England to antiquarian research, especially when these specimens are unique, and would, exhibited even in our smoky capital, be a proud memorial of the perseverance of our travellers. كلك literally means "a reed," and from these being used originally in the formation of rafts, the name has become general for the structure.

The Abu Chellach, or, as I shall now designate it, the Nahrwan, continues for a mile to the North, and then gradually curves to the Westward, passing between the almost obliterated ruins of Jarjariyeh and the head of the Shaour canal, which is now close to the East bank of the Tigris. To the North of the head of the Shaour, another dry bed, sunk into the country like the Abu Chellach, but called Kuweit or Chuweit, leads also into the Tigris, and leads to the belief that the Nahrwan here bifurcated in its decay, and that the Chuweit is merely a branch of the Abu-Kellek: both must originally have isolated the town of Jarjariyeh, which stood on an artificial island formed between the Tigris to the South and the bifurcations of the lower course of the Nahrwan on the East and West of it. But to continue the narrative.

At 5h. C. T., after I had settled to my satisfaction the topographical features of the country around the Abu Chellach bed, we proceeded in a direction of 300°, and in half an hour came upon the course of the old stream that I have mentioned above; continued in its bed, and at 5h. 45m. crossed the head of the Nahr-Debuni, a lateral duct from the Nahrwan, which, extending in a line of 185°, watered the large peninsula now termed Debuni. At this point the head of the Shaour canal, a similar duct, that irrigated the country East of the Abu Chellach or Nahrwan, bore 335°. At this spot the bed of the Chellach in coming from the N. W., after throwing off the Shaour and Debuni canals, forms a curve in the direction of 132°, towards its junction with the Tigris opposite to Ras Samr. At 6 h. we halted on the banks of the Tigris, for the heat had become very oppressive, and pitching the small tent, we sought its shelter from the glaring sun above.

Tried here to obtain a little sleep by way of compensation for last night's restlessness, but, as if doomed to suffer the penal visitations which afflicted Pharaoh and his Egyptian subjects, both day and night appear in the spring months, when all nature is vivifying, to have a torment at hand for the passing hour. The mosquitoes and sand-flies exert themselves incessantly throughout the darker hours of our existence in this country, and the day is no sooner ushered in than they are relieved in their labors by a fly that gives no peace, so lively are its attacks and so pointed is the weapon it is armed with. I am not aware if the species is known in any other country. I certainly have never met with it, nor am I entymologist enough to determine under what head of the order it should be classed. Like the common fly to

all outward appearance, and of the same size, you notice not its insidious approach; it has, however, no sooner alighted, than its sharp, needle-like, proboscis, resembling that of the mosquito, is at once inserted into the skin,—not with the insinuating process of that insect, but with a thrust that makes one start as if with an electric shock; and while perhaps you are bent down in the act of rubbing the part attacked, opportunity is taken of your position to assail you in the rear, which soon again brings you to the attitude of "attention," and ready to give a bystander, whom you can scarcely doubt has taken the personal liberty of thrusting a needle into you, a knockdown blow. Equipped as I generally am on the road with but one stout suit of clothes, worn with my boots night and day, after the fashion of the Arabs, for the entire period I may be travelling, whether it be for a week or a month, I thought myself tolerably well fortified against their attacks, but I was obliged to confess myself vanquished, for these annoying insects made their way to the bloody repast through everything more pervious than a coat of mail. This distinct species of fly frequents the banks of the river only, and is not to be found, I believe, but in alluvial districts.

Pursued our journey at 9h. 50 m. C. T., in a direction of North, and in ten minutes we gained the head of the Shaour canal, after passing the ruins of Jarjariyeh, which exhibi tnow but insignificant mounds, and a few bricks forming part of a building are all that is left of a considerable Town frequently mentioned by the old Arab writers. The direction of the Shaour canal is slightly curving between 100° and 110°, and the head of another arm of the Nahrwan, termed Abu Halifiyeh, bears from it 320°; our road onwards lies on this line. At 10 h. 30 m. crossed the Chuweit, a dry bed 70 yards broad, which I have mentioned before as being part of the Abu Chellach and Nahrwan.—At 11h. reached a long line of mounds, evidently the banks of an ancient canal, that extend as far as I can see on a line of 52° and opposite 210°, towards the Tigris.—Between Chuweit and these branches the bed of the Nahrwan itself is not distinguishable, for the inundations have swept it away; but immediately afterwards, on approaching Abu Halifiyeh, the traces are recovered, and its bed becomes then the high road that I pursue. Twenty minutes onwards from the offshoots I have just described, are situated four other canals that emanate from either side of the Nahrwan. The two on the East bank have banks at least 50 feet high, extending in a line of 11°; those on the west bank have a direc-

tion of 220°. These canals are at present termed Abu Halifiyeh,* and from this place to the North, the Nahrwan, though an excavated bed, assumes all the characteristics of a natural stream. I estimate its breadth here at 70 yards, and the present depth of its bed below the adjacent country varies from 6 to 9 feet. In ancient times, however, it must have been considerably more; for deposits and drift have, doubtless, contributed largely to fill it in the lapse of time. After 15 minutes' halt continued our progress over a rich grassy sward growing in the bed of the canal, and at 12 h. 55 m. encamped for the night at a spot from whence two lateral ducts had their origin. The mounds forming the banks on the eastern canal are certainly of 60 feet elevation, and are named Qubeht-al-Khiyat. From their summits I obtained a good view of the country, and observed the following bearings:—position on Abu Halifiyeh, 146° 30′; Qabr Hadbeh, 185°; Humaniyeh minaret on the Tigris, 261° 30′; Khore-al-Durb, a similar eminence to this on the Nahrwan, 319°. Sun at setting for variation,† 288° 30′. This position was further determined by a meridian allitude of *α* Ursæ Majoris, which gave its latitude 32° 50′ 15″ North. Parallel to this canal, and South of it 200 yards distant, another irrigant, of less breadth, has been subsequently dug, from the West bank of the Nahrwan 300 yards N. W. of the Qubeht-al-Khiyat. This has no name attached to it at present. These lateral cuts are about 15 yards broad only.

April 25.—Another sleepless night, from the myriads of sand-flies which, baffling all efforts to keep them out, find their way within one's clothing. They are more annoying than the mosquitoes in this respect, and instead of being refreshed with a night's rest—the relief of the traveller,—we pursue our journey feverish and dispirited. The Arabs are equally affected, and this morning complain bitterly of these annoyances. At 12h. 25m. C. T. we advance again in the bed of the old stream, but our prospects of finding water appear to be fallacious, for the hollows where it had collected have hitherto shewn a persevering drought. The course of the Nahrwan is now 320°, and the canal noted

* A high mound in the desert to the East, called Gumehs, bears from Abu Halifiyeh 62½° two or three miles distant. It may mark the site of the old Christian monastery called Deir Kuneh of the Arab geographies, and the Mari of the Chaldean records. In a direction of 248° other extensive mounds are seen, at present styled Qabr Hadbeh: they are about half way between the Nahrwan and the course of the Tigris.

† Variation deduced from this, 3° West.

as N. W. of the last station, runs in a line of 185°. At 1 h. two other ducts were passed,—that from the right cut in a direction of 195°; 102° being the bearing of the eastern one. Fragments of brick and pottery indicate the site of an extensive village on the right bank. At 1 h. 25 m. arrived at the Khore-al-Durb canal, which has very elevated banks, and differs considerably in its course from the rest of the irrigants emanating from the East bank of the Nahrwan, it being 72°. Some extensive mounds, denoting the position of a city from their name of Modain, bear from the Khore-al-Durb 238°, and may be a mile and a half distant. Humaniyeh minaret from this spot is seen in a line of 228½°. Proceeding on at 1h. 40m., at 2h. a canal runs from the East bank in the direction of 85°; and at 2h. 45m. we came upon a venerable old tomb on the left bank of the Nahrwan, being the first erect building we have met with. It is called Imam Imlikh: is a revered spot, and doubtless the last resting-place of an early Mahomedan sage, for the bricks the structure is composed of are large and well constructed, such as we see only as belonging to the early Mahomedan and Sassanian ages. On the approach to Imam Imlikh, the banks of the old stream become more elevated, and on either side, for a considerable distance around, exhibit the ruins of extensive towns. The Nahrwan here makes a bend to the West for a short distance, and then pursues a waved course to Qabr Harbi, a modern grave, on the mounds of a large canal that left the West bank of the stream in Latitude 32° 56′ 00″ North. A mile N. W. of the old Imam was the place spoken of as always containing water longer than any of the pools in the Nahrwan's bed, and our disappointment was great, therefore, at not finding the essential article. We have a small quantity still left in the skins, but the horses have now been without for the last 24 hours, and as there is no hope of obtaining any further to the North, I am reluctantly compelled to retrace my steps to the Tigris, as after quitting this spot, the space between the ancient stream and the river is increased at every mile. I had calculated, in the event of not finding water, on the proximity of Arabs, particularly on the banks of the Tigris, from whom I might have obtained a camel or two so as to convey a sufficiency of water for myself and a couple of the party, and thus extend the examination as far as Diyaleh. In this I am frustrated also, for since leaving Kut-al-Amareh, though a hundred miles of territory has been traversed, not a human being, other than ourselves, has been seen; and

this is surprising, for both the Shammar Togh and the Dawer Tribes are generally in our present neighbourhood. Some dispute with the local Government on revenue affairs has called them to the banks of the Diyaleh River, and there is nothing left but to leave the interesting canal for the present, and embrace the first opportunity of completing it that a plentiful supply of rain will only afford. As we were all fatigued from want of sleep, although but a short time in the saddle, I was glad to pitch the tent, particularly as the day had set in very oppressive. The natives of the party were not long in taking advantage of the halt, if one could judge of the sounds attendant upon somnolency, for these were poured forth in every variety of cadence, to which it is not improbable I added a note or two, for I soon followed the example.

Somewhat refreshed, but feeling the want of water, we pursued our journey at 9h. 50m. C. T., and at 10h. 10m. crossed the canal on which Qabr Harbi is situated. This, and two others contiguous to it to the Northward, leave the right bank of the Nahrwan, and curving, follow a direction towards the mounds termed Modain ; but as I have more extensive observations here on my second visit, I will defer noting them until they are arrived at in due order of the narrative. At 10h. 30m. we continued on a course of 290°, and in ten minutes a fantastic canal, termed the Shat Sheyleh, was reached. It comes from the Nahr Adeleh, in a direction curving from 287°, and continues afterwards in a line of 156°. Its banks are considerably elevated above the country. We now kept an irregular course in its bed, and at 11h. 5m. the place of its junction with the Nahr Adeleh was distinctly marked. The Nahr Adeleh, or " the straight canal," as its name implies, is an undeviating line that formerly watered this part of the country between the Nahrwan and the Tigris, and though I did not trace it to its source, I presume it derived its supply from an offshoot of the Nahrwan now called Aghab. Its arrow-like formation is represented by 335° and 155° of the compass, and great pains appear to have been bestowed in maintaining an evenness of breadth throughout the line of its course. The marshes, formed during high rises of the Tigris, that surround the remnants of the old Christian monastery and city of Deir-al-Akul, extend at times as far as this canal ; and indeed have in part swept it away. Qabr Harbi bears from the junction of the Sheyleh with the Nahr Adeleh 111°. At 11h. 15m. continued in a

line 299° over a plain strewed with broken bricks and pottery; and at 11h. 45m. reached a mound bearing the present name of Mezayrid. It marks the site of some extensive building which bisected a canal coming from a direction of 18° and extending to 198°, in the flourishing period of the province. A similar mound, called Kuweit, is seen at the Southern extremity of the canal; and the mounds of the Deir-al-Akul, environed by a sea of water, can be distinguished from the station of Mezayrid, on a line of 214°. This canal I believe to be a continuation of the Aghab, and probably is the same that disembogued in the Tigris where the present Rudad bed is marked on the map. From Mezayrid the minaret of Humaniyeh is a little to the Eastward of South. Some clouds in this direction prevented my obtaining an exact bearing. Proceeded at 12h. 5m., crossing the bed of a marsh which is plainly marked by a number of bivalves strewed in every direction over its surface. The drought of the last two years has, however, evaporated its contents, and for the first time, I believe, during the last ten years, this part of the country has become passable to the traveller. At 1h. 10m. reached a spot where a canal from the Nahrwan, called Efta-al-Tej, bifurcates,—one portion taking a direction of 195°, the other west, and the original conduit is traceable from a direction of 25°: our course to this was 292°. Leaving again at 1h. 25m., and keeping on the same track as before, in 20 minutes we encamped at sunset on the border of a marsh that is said to extend from the Bostan-i-Kesra, and to flood the whole country contiguous to the Tigris as far South as Deir-al-Akul. To see the ravages that the floods are daily committing, it is surprising, indeed, that so many vestiges yet remain, from which we can obtain a partial glimpse of the former prosperity of this much abused province.

The following morning at daybreak we continued our journey, but the road we were compelled to take to avoid the marshes was so circuitous, that I could not keep a record correct enough to give the route any value.* Enough, however, was seen in the course of the morning to show that at one time the whole of the peninsula between the Diyaleh, the Nahrwan, and the Tigris, was a very populous tract; and, moreover, the fragments of ruin that we frequently stumbled upon, prove that it was adorned with numerous structures of well built brick. Canals

* This is immaterial, for I purpose at a future time to examine the neighbourhood of Ctesiphon at my leisure. It will deserve more than a passing glance.

cross and recross each other in a diversity of lines the whole way to the Diyaleh, and, in the immediate vicinity of what I presume to have been the environs of Ctesiphon, become a labyrinth of net work. The fine old palace of Anushirwan has been our leading mark, and so clear was the atmosphere of the morning, that the great arch of its vestibule was distinctly visible at twenty miles distance. It stands up, as it were, in mockery of the devastation around, and is a grim, venerable, and unique emblem of an age whose people at one time swayed the destinies of the Eastern world, and who for pomp and barbarous magnificence stood unrivalled among its nations. As I pass it, the sun is brilliantly setting at its back,—a fitting type of the evening of its existence, and the sombre façade of the stately pile, casting its shadow far to the East, seems to invite the night-loving owl and the jackal to wander from their hiding places and to proclaim with screech and howl the utter desolation of the land. What a contrast to the morning of its glory! The bright orb, when lighting up the face of nature, then cast its first ray into the magnificent hall of the Cæsar, and was doubtless the signal for the Prince, the court, and the subject, to follow the devotional prostrations of the Magi in adoration of the luminary, according to the doctrines of Mithraism. What a scene of animation these plains must then have presented; when the multitudes that inhabited a Persian capital, and did homage at a Persian Court, bound in one religious feeling, were congregated in the open air for the purpose of joining in ceremonies universally prescribed by their faith! And now how changed is the picture before us! The old race and the old faith are extinct in the land, and with the exception of the solitary pile I have spoken of, its structures have passed away. A few miserable tents—the abode of comparative strangers to the soil, who are alike miserable in their condition and their ignorance—are sparingly scattered over the classic ground, their inmates without devoting a thought to the former occupants, wander amid the old ruins in search of a precarious livelihood, either by plunder or by hard toil,—and exhibit to the travellers a striking contrast between the past and present history of the land.

During the heat of to-day I pitched the tent at a short distance from an encampment of Dawer Arabs, and in a short time was visited by an old friend of mine, Abd Aly, the Sheikh of this small tribe. These are the first people we have met with since we left Kut-al-Amareh, and my party were therefore in great glee at the prospects of a repast, for I had

bought a sheep on the occasion. The Arabs, however, were somewhat annoyed at my not having partaken of their hospitality by going direct to their tents, but this I managed to overrule by pleading the number of my party and the smallness of their present camp. This was, however, not my principal motive, for I had a desire to rest during the heat, as we had again been annoyed last night by the insects, and I preferred quiet to the conversation always at its height in an Arab camp when a new party arrives. The excuse was received, and I gained my point. When I awoke again, found that the Tribe had in a body visited me, as I had not gone to them, and while the people were busily occupied in preparation for the coming meal, they amused me considerably with their pertinent and caustic remarks. They have but loose and very vague ideas with regard to Europe at all times, but the revolutions enacting there have reached them, and a report exists—founded on the occupation of Wallachia and Maldavia—that the Russians are in full march upon Constantinople. When the Sheikh related this to me, an elder, who appeared to pride himself upon his superior diplomatic knowledge, declared that such was the project of the Muskoof,* and that, moreover, the Dowlut Ankrisi† had arranged with the Russians for the partition of Asia Minor; the plains south of the Taurus being apportioned to the latter, while the "Muskoof" appropriated the northern provinces. He further declared that the Dukhani‡ was here in furtherance of these views, and concluded by saying, ya! Kabtan, oh Capt., am I not speaking the truth? I answered his appeal with a laugh, but I could see the theory was a favorite one with the Tribe, and, indeed, is general among the Arabs in these parts. After they had settled the subject to their satisfaction, one and all declared that, let who would come, they could not be more oppressed than under the Government of the Sultan and his Pashas, and were loud in their complaints at the rapacity of the present Governor: and from what I hear, they have good reason to be dissatisfied. The contrast they drew between the word of an Englishman—a proverb in these parts—and the faith of an Osmanli, though it was intended to flatter, was gratifying enough, for I am aware that it is really estimated.

* The general name the Russians are known by among the Arabs, from Muskovits. They are sometimes styled "Ahb-al-Rus"—the family of Russ.

† Dowlut Ankrisi, "the English Government:" the Arabs always interchange the r with the l when the latter follows ق.

‡ The "Smoker"—the name given by Arabs to all steamers.

As soon as the feast had been concluded, we took leave of the Dawer Chief and his people, and shortly afterwards passed a large camp of the Shammar Togh, who are at present assembled between this and the Diyaleh in hopes of being able to arrange some less vexatious and oppressing terms with the local Government. Numerous irregular horsemen of the Government are going to and fro between Baghdad and the Shammar camp, but I doubt if the Arabs will succeed in obtaining a more favorable scale of revenue tax from Nejib Pacha. Their plan, however, is to attempt to procure a less demand upon them, and failing in that, they will accept the contract, without any hope or intention of fulfilling it. If a small sum should be short at the end of the year, no very active steps are taken to obtain it, but if, as is generally the case, more than half of the assessment remains unpaid, troops are then sent to enforce the claim by coercing the tribe. These as often get beaten as succeed in their errand, and then the Arabs fly to more distant regions until the offence shall be forgotten. In the meantime the country is deserted, and generally the trade is stopped, for when rebellious, the Arab at once closes up the road to commerce, because he knows well that he can make better terms when obstructing the trade than when living under the protection of the Government. To do this, however, he must remove his tents, his family, and flocks, out of the reach of the authorities, and unless compelled, this is the inconvevience that attaches him to one locality, and renders him without any adequate check to control him, in the time of his allegiance a comparatively peaceful settler.

As we approach the Diyaleh river, traces of the fixed abode of man are becoming visible in a partial cultivation; but so impoverished is this once prolific province, that the agricultural district does not extend ten miles south of the capital. The insecurity of property is evident in the circumscribed extent of the fields beyond the southern bank of the Diyaleh river. These, however, exhibit goodly crops of wheat and barley, and tend at least to shew the richness of the soil and the capabilities of the province as a granary alone. The vestiges of the ancient canals to the East and North-East of Ctesiphon, tell a tale of former fertility that contrasts sadly with the meagre patches that are observable, few and far between, in its present neighbourhood; and the wire-drawn irrigants of the modern race, that an infant can step across, compared with the stupendous conduits of antiquity, heighten the pic-

ture of decay before us. We passed the night among these "time-honored relics," and reached Baghdad in three hours, the following morning, after crossing the Diyaleh by the bridge of boats.

A plentiful fall of rain in the succeeding winter, giving every hope of finding water in the Nahrwan, induced me to leave again on the 3rd March, and, equipped as before in respect to instruments, &c., I left Baghdad with the intention of completing what I had left unfinished the preceding spring. My friend Mr. Taylor* accompanied me as a volunteer, and not only saved me much time, but rendered much assistance by noting the observations made. We issued from the Bahd-Sherki or S. E. gate of Baghdad at 7h. 5m. C. T., and took the beaten road past Gherara, leading to the ferry over the Diyaleh river. On both sides of our tract the cultivation is fast verging to perfection, and the present verdure of the country contrasts vividly with its arid summer garb. Such is the difficulty of travelling to the south of Baghdad, we are compelled to take, in addition to a suitable guard, sufficient provisions, and even water, for the period it is intended to remain in the desert, and thus a caravan is formed of a dozen mules even when journeying to a short distance. We amount at present to that number, and my old friend Sheikh Subba, quadruply-mated as he is, being glad of an excuse to get away for a brief period, undertakes the conduct of the party as before.

The Diyaleh, now spanned by a bridge of sixteen boats, was crossed at 9h. 22m., and proceeding a short distance along its East or left bank, we encamped on a beautiful evening about one mile North of the bridge. I should have mentioned that the space intervening between the city of Baghdad and the Diyaleh is an interesting locality, for of late the mounds known as Tel Mahomed, and some smaller ones contiguous to the Tigris at Gehrarch,† have yielded not only masses of brickwork inscribed with the Babylonian character, but many sepulchral vases of a new form, which have contained, in addition to the usual ashes of the dead, ornaments of copper, beads, glass, miniature dogs in copper ; and while I write this, some massive copper balls, hollowed in the centre,

* Mr Taylor has obligingly presented me with the sketches he made on the journey. They accompany this paper.

† Gehrarch is generally recognised as the Kilwatha of the Arab geographers. The position assigned to this old city certainly corresponds with the modern village, and the adjoining mounds will doubtless yet display, if perfectly excavated, further interesting relics.

have been discovered. These bear a cuneiform legend in one line encircling them. The metal is very pure, and the uniform symmetry of the globes, having a raised edging around the cylindrical hollow, shews that the art of moulding and casting in these early times had attained some eminence: indeed, to the shame of the modern city be it said, Baghdad itself, in this 19th century, has not a foundry capable of fusing either copper or iron. Another small mound adjoining the main road leading to the Diyaleh bridge, half way between it and Gehrareh, and on the margin of the Hor-al-Zafrani,* is another old vestige, and to this a tale is attached that prevent individuals passing it at night unless in parties of five or six at a time. It is said to be the abode of a black spirit, which, though often combated with, has never been defeated, its ærial nature rendering innocuous the thrust of lance or dagger. The relater of the story declared he had personally seen it, and had evidently a very wholesome dread of the black goblin's influence. It is a spot I would recommend as a locality for a house or tent, for I believe the premises would be safe from the visitations of Arab thieves.

The Daffafeh Arabs are at present encamped in our neighbourhood, and the carpet had scarcely been spread when we were favored with a visit from the Chief, who, for pompous loquacity, certainly might have occupied the position of Mufti to the city with advantage. His rags, however, were not in keeping with his inflated diction, but it was evident that he was a man of some sense when he descended from his "Pegasus" to rational converse. He had adopted this style, I found, to give us an idea of his consequence, and, if possible, to deter us proceeding further on the journey or at all events to impress us with the belief that his escort was necessary to ensure us a safe protection on the road. Finding we turned a deaf ear to him, he became communicative, and really possessed a fair knowledge of the history of his country,—indeed, more than I ever met in a desert Arab; and I afterwards found that the family to which this man belonged were but a short time ago one of the wealthiest and esteemed of the once rich Daffafeh tribe, who, by the commission of an act of treachery, had become more impoverished than almost any other. Sulyman Pasha, when he fled from Baghdad some thirty years ago, escaped from the south gate, and sought protection among the Duffa-

* Saffron marsh: a low part of the country that receives the inundations of the Tigris and the Diyaleh, principally the latter.

feh, whom, while he was in power, from a friendship for the tribe, he had exempted from the exactions that others were subject to, and on his downfall naturally looked to them to shelter him from the price the new government had set upon his head. The offer was too tempting, however, and the father of this very man, who was then the chief of the Daffafeh, agreed to violate the sanctity of his tent, by the murder of his protected guest. When seated near the unsuspecting Pasha, by turning the conversation on the merits of their respective blades, the former was induced to yield his weapon to his supposed friends for examination, and in an instant, with a single sweep, the head of the victim rolled in the dust ! The coveted reward was duly paid on presentation of the decapitated member, but the treacherous deed was not lost on the new Pasha, who feared that the Daffafeh, powerful as they were then, might probably be influential in his own downfall. The case served as a pretext, and as a lesson, and in a short time the Duffafeh, justly stigmatized for their perfidy, and abandoned by the neighbouring tribes, who abhorred the desecration of the rights of hospitality, became the objects of spoliation; and, distrained by the Government, their possessions gradually dwindled away. They still wander on the scene of their crime, a reproach among their fellow men, and withal miserably poor and crest-fallen.

We had selected a bad spot for our bivouac, and accordingly found but little sleep, for the high-road, along the left bank of the Diyaleh, led past our beds to the city. Sleeping as we do in the open air, and on carpets spread upon the ground, the pattering of the laden animals on their way to the city kept us constantly awake. Brushwood is the chief article used in Baghdad by the poor for fire-wood, and is all brought from the desert south of the Diyaleh. The beasts are laden and driven during the night, so as to reach the gates of the city by sunrise. While preparing for the mount, we examined a man who had lost a foot close off at the ankle by the bite of a shark when swimming the Diyaleh about forty years ago, and the appearance, therefore, of these monsters in the Tigris and the Diyaleh is not so recent as we have hitherto imagined. The Natives deem them, however, new visitors in these fresh-water-streams, and it is certain they have become both more numerous and more dangerous in the last few years. Bathing in the Tigris, indeed, six years ago was attended by no dread of unseen monsters, but such is the alarm at present, that it has nearly ceased to be

practised. Two instances of accident have come under my own observation, and I have heard of many more. The last year they were exceedingly ravenous, and were found as high as Samarrah, a distance of 600 miles from the sea. The credulous will raise a doubt as to the identity of the fish, but we have caught and examined them on more than one occasion. I deem this a curious fact in the natural history of the "Squalidæ," and believe the propensity to ascend so great a distance in fresh-water-streams has not previously been known, for I have not met it recorded anywhere.

At day-break on the 4th, we resumed our route. The morning was cold, fresh, and clear, and the Persian hills of Luristan, though some ninety miles distant, stood out in fine relief, snow-capped as they were, against the sky beyond. Took a straight course for a ruin termed Mismai, and in an hour and five minutes from our encamping-ground were on the summit of the old structure. Half way we had passed over the site of a considerable town, now termed Reshadeh. The alignments of the walls were partially distinguished in the form of an oval or a circle, but the inundations and neglected repair of its canals have done their work, and have nearly swept it from the face of nature. The area of the town bears evidence of being frequently submerged, but here and there faint vestiges of buildings are still traceable, particularly on the side nearest Mismai, which appears more elevated, but I think only from the principal buildings having stood in this quarter of the city, which must have been a large one—I computed its diameter as $1\frac{1}{2}$ miles. A canal coming from the N. E., shewing it derived its water from the Nahrwan, bisects the town in its entire length, and throws off a branch from its centre to the S. E. in the direction of Mismai; its appearance confirming, I think, the supposition of this portion being occupied by the principal buildings.

Mismai itself has been a stronghold or "keep," and perhaps acted as the citadel to the town I have described. It is evidently a Parthian or Sassanian edifice, and to all appearance dates from the same period as the other ruins contiguous to Ctesiphon. Its shape is that of an irregular parallelogram, having had three gates facing the west, east, and south points. The walls, massive and thick, at the present time are about 35 feet above the plain. They are composed of the large sun-dried bricks, 14

inches square,* and where the accumulated debris has been washed away, particularly in the deep furrows occasioned by rain, the kiln-dried brick of large dimensions is found also, but, like those of Ctesiphon, they bear no inscription. The eastern face of the building is 280 yards in length, the western 200 yards, the northern 150 yards, and the southern—that facing towards the palace at Ctesiphon—being the shortest, is 95 yards only. A large canal, coming from the N. by E, supplied a ditch or moat of considerable breadth, encircling the fortress, and the canal before mentioned as bisecting the town to the West of it, contributed by an arm to its supply, or rather was led into it after traversing the S. E. portion of the city. This arm derived its water from the same source, viz., the first canal that emanated from the Nahrwan immediately to the South of Sifweh, and an opening in the ditch led off the superfluous water, by another long canal, to the S. E. ½ E., for irrigation.

The following angles were obtained by Theodolite from the highest part of the fortress of Mismai, and near to the west gate of the city; 360° set to the highest Minaret in Baghdad, being that called Suk-al-Ghazl, the magnetic needle 303° 30′.

The minarets over the shrines at Kathemein...	2°	5′
Sheikh Shabood-din.....	3	17
Moadhem minaret.....	4	45
Abu Arug, tomb on East bank Nahrwan.....	57	59
Upper cut from the Nahrwan.....	54	20
Tel'Rishadeh, Town to West of Mismai.....	331	24
Diyaleh tree and bridge.....	323	27
Jaffer Tomb and Trees.....	299	36
Tel' Omer, in the ruins of Seleucia.....	264	40
High part of Seleucia wall on the Tigris.....	257	59½
Tomb of Selman Pak.....	248	35
Centre of the Tak Kesra, great arch at Ctesiphon	246	33

* This seems to have been the material in general use in the later Babylonian, the Syro-Macedonian, and the Parthian, periods, particularly for fencing cities and for other solid works. The Majelibi at Babylon, the ramparts of Seleucia, Akr-Kuf, the walls of Qadesiyeh, the remains contiguous to Tak-Kesra, the enclosure of Nai, and the place we are treating of, comprise, I believe, the only visiting ruins where this form of construction is observable at present in the country. The more early are indicated by having reeds placed between each layer of bricks, like at Babylon and Akr-Kuf. Bitumen may be occasionally remarked also as supplying a mortar, but it is not general: at the same time, it is sufficient to point out the truth of the record wherein the Babylonian structures are detailed (See Genesis, Chap. XI. v. 3),—if "slime" as rendered in our version of the text, be, as is generally considered, a free translation of the Hebrew, and signifying Bitumen.

Bostan-i-Kesra, high part to the South.....	236°	21′
Mound with a mark upon it.....	146	5
Abu Gubbeyr.....	120	43
Point of the Chef or Kef canal on Nahrwan...	108	10

Re-mounted at 2·48, and traversed a plain strewed with fragments of every description of pottery—both glazed and plain. The glazed portions were fantastically figured with neat devices, and the many remnants of broken glass shew it was an article in extensive use. Porphery was observed too in the neighbourhood of Mismai, as well as beads and corroded pieces of metal with a few copper coins in the same state. At 4h. came to the head of a canal now called Abu-'l-Agul,* that extends in a direction of 140° ; at 4h. 56m., another canal, termed Khushm Abu Dheeb, was passed. Its line was 237°, and at 5h 48m. we arrived in the bed of the Narhwan, close to a lateral duct with high steep banks, termed Khushm-al-Khor. We then crossed the canal direct for Sifweh, and at 6h. 10m. were glad enough to reach our tent, pitched among its ruins, for the sun had become very oppressive.

Sifweh is a name given to the ruins of an extensive Town on either bank of the Nahrwan, from the tomb of one Sifweh that stands amid the ruins, and who is described as being the Kadi of the former town of Nahrwan, which is identical with this place. The old name of Nahrwan, indeed, has been lost in the appellation of its defunct Magistrate, who was a profound legislator and theologian. The ruins are at present considerable, notwithstanding the locality is visited by caravans from Baghdad for the purpose of carrying away the materials it was built of. The Diyaleh sweeps past the right bank of the Nahrwan at this spot, and indeed has carried away a considerable part of the Town that stood on the margin of the old canal. The breadth of the Nahrwan here by measurement was 117 yards, just double that of Diyaleh, and I can trace its bed, quite distinct from the modern river, in waved lines trending in the direction of a tomb called Habesh. I must, however, leave this for future examination; but it is evident to me that the dam now in the Diyaleh, a little south of this spot, was, in the days of the Nahrwan's prosperity, merely a bulwark erected to prevent the waters of the

* Properly Akul., I write the names as they are pronounced. The whole of the names, indeed, are modern appellations, and unworthy of notice, except as serving to distinguish one object from another. Akul is the name of a thorny plant that grows in great quantities in the desert, and a favorite food of the camel.

Diyaleh flowing in their natural course to the South, and to turn them to the S. E., into the new channel designed for them.

The following angles were obtained from the highest part of the ruins near the Tombs on the left of the Nahrwan at Sifweh, by theodolite; 360° being set to the minaret of Suk-al-Ghazl at Baghdad, the north point of the magnetic needle shewing at the same time... 246° 30′

Shrine of the Imams at Kathemein	16	48
Imams Habesh	146	14
A small round mound on the Chef or Kef.	256	40
An isolated pile called Joziyeh	263	38
Abu Arug	279	22
Two lateral ducts of the Nahrwan, termed the Khushm al Khor	285	12
	292	18
Diyaleh tree and bridge	315	37
British Flag, the highest object in Baghdad	358	59
⊙ near limb at setting for variation*	22	54

In the evening I observed too an excellent meridional altitude of *a* Canis Majoris (Serius) 80° 28′ 58″, which places its latitude as 33° 25′ 23″ North.

Monday, March 5th.—Filling the skins at the Diyaleh, we pursued the line of Nahrwan, which continues to the South for a mile below Sifweh, and meeting with the superior margin of the alluvial tract, is conducted along it, at once to the S. E. Another mile and half on this course brought us to the remains of the first of the lateral branches that emanated from this magnificent canal. They are on the right bank, and at present are known by the names of Khushm-al-Khor. The second arm is the highest, and I therefore selected it as a station. Setting up the Theodolite, I obtained the following angles; the instruments as before fixed 360° to the minaret in Baghdad, and the needle at 256° 00′.

Moodhem minaret	12	00
Shrines of the Imams of Kathemein	14	39
Khan-i-Beni Saad	94	06
Habesh Tomb	121	28
Abu Arug tomb, close to on left bank	172	10
⊙ Remote limb for Azimuth	212	18
⊙ Altitude lower limb for do	10	37
Chef or Kef, high part of the canal	245	38
Abu Ghubbeyr	261	00
Direction taken by the Khushm-al-Khor	274	30
Mismai, station of yesterday	283	55
Tak Kesra, centre of the great arch of Ctesiphon	289	9

* Variation here in 1849—3° 40′ W.

Left again at 1h. 52m., and kept a course to the left of the Nahrwan, which, between Khushm-al-Khor and Joziyeh, makes a slight curve with its convexity to the S. W. Reached Joziyeh at 3h. 10m., the last mile having been in the bed of the Khorassan canal, which formerly joined the Nahrwan at Joziyeh, where a considerable town once stood, and, from the appearance of the bed of the river, I look upon it as the site of a well-constructed bridge.

The Khorassan canal, that is traceable to this point, now reaches as far as Abu Khomeis only—that is, its waters attain only to that place at present, whereas formerly, the canal, after irrigating the intervening country from the Hamrin hills to the Nahrwan, was also enabled to supply the latter stream with a copious body of water. From Joziyeh I obtained the bearing of Khushm-al-Khor as 331°, and Mismai 198°.

The day had now set in cloudy, with an increasing Southerly breeze that swept along the desert, accompanied in its progress by whirlwinds of dust that were quite painful to ride against. From Joziyeh to the next substantial branch thrown off by the Nahrwan, which is named Chef, the bed of the ancient canal is as straight as an arrow in a line of 128°. This course was pursued. Leaving Joziyeh at 3h. 20m., in thirty two minutes afterwards a lateral duct, termed by the Arabs Khushm-al-Aliyan, that watered the country in a direction of 210°, was passed, and the greater branch, called in the corrupt patois of the country Chef,* was reached at 4h. 20m. Both these canals, and indeed all the offshoots that we have hitherto seen, leave the right bank of the Nahrwan. The mounds forming the banks of the Chef are of considerable elevation; from the highest point I obtained a round of angles by the Theodolite, the instrument being set 360° on the centre of the great arch of Ctesiphon, the following being to the right :—

* Kef is the proper orthography of the name of this canal, from the Persian كف—signifying the "palm of the hand." The Arabs here, as usual, have a story to relate in support of the origin of the name, and declare that the son-in-law of the prophet, the Khalif 'Ali, lost a hand on the spot. We have no historical account, I believe, of this circumstance, nor of 'Ali's wanting the member, but the Arab tradition and retention of the name invests the locality with some interest, for we know that the famous 'Ali defeated the Khuary rebels in a great battle—termed the battle of the Nahrwan,—and in which it is not unlikely he received a wound in the hand. I believe, however, the term Kef is more particularly referable to miracles, where the hand is the instrumental member, and it is not improbable, therefore, that the devoted followers of the chief were enabled to sanctify the victory by the proclamation of a miracle which may serve to identify the site of the battle at the present day. The miracle related of the leprous hand in Exodus IV. v. 6 and 7, is termed the Kefi-Seytha, or the "white hand." In the angle formed between the Nahrwan and the Chef branch, a considerable town existed in a former age.

Fragments of every kind of building materials, and broken domestic articles of pottery, lay in every direction around.

Abu Gubbeyr...	8°	10′
Mismai, station on the mound.....	25	00 approx.
Diyaleh, single tree.....	40	48
Joziyeh ruins, on the right bank of the Nahrwan...	102	06
Abu Arug.....	117	00
High part of the canal termed Tamerrah...	262	03
Magnetic North by the needle.....	207	00

I tried also to obtain a latitude, but the lurid redness of the atmosphere, charged as it was with an almost impalpable dust, frustrated my attempt; and by the time we had dispatched our frugal meal, the wind had risen to a gale that precluded all hope of making any further survey for the time. I therefore determined on tracing the canal only as far as Medar, where Arabs are reported to be encamped, and consequently where we are sure of finding water, for our skins are again empty. Leaving Chef at 6h. 35m. C. T., we continue our course with difficulty, from not being able to penetrate the dense mist occasioned by the gale; the banks of the old stream, however, served as a guide. At 7h., extensive ruins, stretching for a mile along the right bank of the Nahrwan, now bearing the name of Lateriyeh, were passed; and in a quarter of an hour more another canal, the Tamerrah, with high mounds, similar to those composing the banks of the Chef, afforded a conspicuous mark for the theodolite. It could not be used, however, for we could not see distinctly 30 yards around us, and as the day advanced, it was evidently becoming more unfavorable; so, suspending further operations, we crossed the Nahrwan in the direction of Medar, determining to return to Tamerrah as soon as the weather allowed of operations being renewed. At 7h. 27m. C. T. we left Tamerrah, and crossing the bed of the Nahrwan, reached some elevated mounds, marking the former existence of a considerable city now covered by them. The usual vestiges were profusely strewed in every direction over their surfaces, and in addition to these, the site exhibited large pieces of the friable deposit of slag in many places, shewing that slag had abounded in the buried structures, or had been manufactured here for works in the vicinity. The glazed tile and jars were also abundant, and its half insulated position, bordered as it was on two sides by the water of the ancient canal, would denote its importance as a city in the flourishing period of the canal. Its present name Medar* is but a modern appellation, and derived, I

* Menar in Arabic signifies a "circle," or the "centre of a circle";—also "place of turning."

presume, from the fact of the Nahrwan curving around the base of the city in a fantastic sweep, not observable in any other portion of its course. It is situate a half mile distant from the left bank of the Nahrwan, and on a clear morning some ruins to the Eastward, called by the Arabs Al'-Ejreb,* can be distinctly seen. These are reported as extensive, and as built of hewn stone. I am at loss, however, to know from whence it was watered, nor could the Arabs inform me, though they say a large canal exists in its immediate neighbourhood. I purpose visiting the place at a future period.

With much difficulty the tent was pitched, as a threatening sky foreboded rain. The strong gusts of wind that we were exposed to kept us in constant alarm for its safety, and on one or two occasions it had nearly been carried off by the howling blast. As sunset approached, the cold became severe, for the cutting breeze searched through our light clothing; and the servants of the party, exposed as they were without any covering, felt its effects in a two-fold degree. Huddled up in a mass under the lee of the small Bechoba, we could hear their teeth chattering with the cold, and I gladly availed myself of the proximity of a few Arabs, who were encamped in a hollow of the mounds, to purchase a sheep for their entertainment. A kid and a miserably lean goat were all that we could obtain, but they served to excite an activity in the party; and a tolerable meal after the fire was once kindled,—a matter of much difficulty,—soon raised the thermometer of their spirits. We were, however, badly enough off for water, for none was obtainable beyond some stagnant rain, having now the consistence of mud, that had collected to the depth of a few inches in a neighbouring pool. By holding the nose, and making use of the teeth as a strainer, the effluvia, and insects with which it abounded, were avoided, and a satisfactory, but by no means palatable, draught was secured. When the flocks returned to the tents in the evening we were further regaled with copious bowls of pure milk and the refreshing "leban"† provided by the hospitality of our entertainers. These are a small family of the Daffafeh, who have had some matrimonial dispute with the larger portion of the tribe, and have settled apart until the differences be adjusted.

* This word is probably a corrupted form for "el-Akrub," "the scorpion."

† "Leban," Milk formed into a sour curd by the addition of rennet, and is a very refreshing and wholesome beverage, especially when enjoying the abstemious regimen inseparable from life on the desert.

During the night we had squalls from every part of the compass, with loud peals of thunder, attended by lightning and some rain. This latter brought old Subba to seek shelter under the canvas, for a martyr to rheumatism, he dreaded its attacks. The confined space of the tent, piled up as it was with the saddles of the party, and the instruments, in addition to my companion and myself occupying a recumbent position, would not admit of a third with convenience. The old Sheikh, however, found room enough between us to assume a squatting posture on his hams, and consoling himself by puffing at his short "Sibeel," buried in his left hand, was not a bad resemblance of the incubus attendant on nightmare, especially when the lightning, making the darkness but just visible, exposed his weather-beaten and grim aspect to our half waking and disturbed fancies.

A hard squall at daybreak from the N. W. dispersed the heavy clouds, and a brilliant morning, as usual in this climate, succeeded to the oppression and leaden sky of yesterday. Surrounding objects were rendered more than usually distinct, and I obtained from the most elevated part of the mounds of Medar a good round of angles with the Theodolite: set 360° on the centre of the great Arch at Ctesiphon, the following objects were observed (March 6th, 1849):—

⊙ Near limb for Azimuth	249°	3′
⊙ Altitude lower limb for ditto	10	15
Ruins of Al' Ejreb, said to be a large city	211	48
Minaret of 'Aberta on the Nahrwan	263	58
Sisobaneh, the first lateral duct on the left or east bank of the Nahrwan	242	45
Ba'Ayr, high part, an inland canal	247	58
Abu Tamerrah, canal of yesterday	30	53
Chef, high part	58	23
Magnetic North	311	00

Leaving the tent and baggage to follow, we rode to the Tamerrah canal, and setting the theodolite 360° on the Joziyeh ruins, the following objects bisected as follows:—

Chef, high part and station	347° 58′
Abu Gubbeyr	308 25
Mismai station	305 40

* I am inclined to think the old name of the Diyaleh, or of that part included between the town of Bakuba and the modern Sifweh, known to the ancients as the Tamerrah, has reverted to this canal. It is, however, mere conjecture, from the similarity of the names. Tamerrah of the Arab MSS., is, I believe, of Syriac origin.

Tak Kesra, Arch of Ctesiphon	274° 49′ 30′
Direction of the Tamerrah canal	221 00
Aberta minaret on the Nahrwan	174 59
Sisobaneh, high part	174 45
Medar, place of observation	127 57
Direction of the Nahrwan's bed	148 00
Magnetic North	301 30

Quitting the Tamerrah canal at 2h. 50m., after being rejoined by the party, we continued in the bed of the Nahrwan, now about 100 yards broad, in the direction given above by theodolite. In this part of the old canal the bed exhibits at present a sea of waving vegetation, for the spring crops are arriving at maturity without being dependant on artificial irrigation. These beds of ancient streams are well adapted for this species of cultivation, termed "daym"* by the Arabs, and moreover well suited to the wants of an idle race like the predatory tribes, who do not fail to fail to advantage of the bounty of nature in this respect. In these old beds, and indeed in every hollow that absorbs moisture, the tribes sow at random a quantity of grain, leaving it to nature either to ripen or perish. So prolific is the soil, however, that except in seasons of great drought a rich crop is obtained with only the labor required for the distribution of the seed. A wet winter indeed brings an abundant harvest to the nomade families, and some species of grain like the black barley attains perfection by the humidity of the dews alone. Thus nature, in these otherwise arid wastes, in some measure provides for the idle and most needy of her children, a remedy against immediate starvation, and they fail not to reap it, however scanty it may be. This year promises to be a very favorable one, and the prospect of the Arab that has in this respect been miserably bad the last two years, is consequently brightening with the spring. It is the theme of delight dwelt upon in every evening "mejlis" ("assembly") of the Tribes, and to witness the scenes of distress last year in the Pashalik would make any one a participator in the universal joy.

At 3h. 30m., or, at the pace we came, three geographical miles distant from Tamerrah, the first of the branches from the left or East bank of the Nahrwan, was arrived at. It bears the name of Sisobaneh at the present time, and its direction will be seen by the following angles taken with the theodolite from its most elevated part,—the instrument set 360° to the station on the Tamerrah canal:—

* Literally means "crops reared by gentle and constant rains," and for this species of harvest is peculiarly applicable.

Magnetic North by the needle	89°	30′
Tel Amr a conspicuous mark	327	00
Bend of the Nahrwan	267	00
Tel Ba'Ayr at the entrance to the canal of the same name, reported to extend to Ctesiphon	246	09
Minaret of the ancient town of Aberta	219	30
Direction of the Sisobanch branch	192	00
Medar, station on the ruins of	11	45
Tellul* Ejreh and Abu Kollak in a line, the latter two miles distant, the former the site of an extensive city	152°	41′

Here the Nahrwan makes a curve to the South, and in this part of its course resembles in its sinuosities the bed of a natural river. At 4 h. 10 m. we left Sisobanch, and in twenty minutes reached the entrance of the Ba'Ayr canal, being a cut from the right bank of the stream. Its direction is 207°, and from it Sisobanch is 323° and Aberta minaret 123½° of the prismatic compass. Re-mounting at 4 h. 35 m., and keeping the right bank of the Nahrwan at a mile's distance from the Ba'Ayr canal, the ruins of an extensive town commences, and extends on to three canals called Rumaylat, separate from each other a distance of a quarter of a mile.

At 5 h. 12 m. the lower of these canals was passed, and from it Aberta bears 117°, and its direction is 190°. A continued line of ruins occupies the space between these branches of the Nahrwan, and points to the locality as having been a very populous one. Nothing, however, was observable beyond the usual remains so often described. Opposite to these, on the left bank of the old stream, is an offshoot termed Sadr, the second on this side of the Nahrwan. Its direction is 77°, and Aberta bears from it 113°; and immediately below it the ruins of this city are entered upon, consisting of disordered heaps of brickwork, that extend for three miles along the East bank of the ancient stream. We reached the only erect portion at 5 h. 50 m., and I was enabled to obtain the meridional altitude of the ⊙ as 101° 44′ 48″, making its latitude 33° 14′ 17″ North.

Aberta is the only position on the Nahrwan that has retained the name it was known by among the early Arab geographers, and must

* تلول Tellul is the plural from the Arabic تل "tell," an eminence or mound, and in this country of vast plains, where seen are entirely artificial. Beneath them are entombed many an interesting relic. The antiquarian sighs as he wanders over and around them, at his inability to fathom their mysterious contents.

have been a considerable city in the flourishing period of the canal. The mounds formed by its fallen buildings are seen covered with masses of brickwork, on either side of the erect pile, for a distance of a mile and a half; and their appearance, as well as the retention of the name, would indicate that it was the last inhabited of the many towns that formerly occupied the margin of the old stream. In Arabic, Aberta * signifies the "place of crossing," and its site was perhaps selected as being directly on the high road from the N. E. provinces of Persia to the capital of Ctesiphon, from which city it was distant but 17 geographical miles. It had perhaps another name in the æra of the Sassanians. It is at present remarkable only as the only spot on the whole line of canal where a piece of a fabric retains an erect position. When seen from a distance, this resembles a minaret, and is termed in consequence 'Minareh' by the Arabs. It appears to me, however, to have been a portion of a massive wall, through which a perpendicular shaft was constructed,—but for what purpose, unless for use as a well, I am at a loss to determine. A portion of its cavity still remains, shewing a neat and compact style of brickwork. I tried hard to ascend the pile, but the bricks were so rotten that they crumbled away with my weight; and was therefore disappointed in obtaining a sight of the great Arch of Ctesiphon, for some high mounds of intervening canals obstructed the view from its base. This building occupies the centre of the town.

At Aberta the bed of the Nahrwan takes a corresponding but opposite curve to that at Sisobaneh. The right bank opposite to the town exhibits a few traces of buildings, but not of any extent, and in the bight, two canals termed Naajeh irrigated the country in a direction of 130°. From the point of their junction with the Nahrwan, a canal called Abu Simsim bears by compass 102°, and Aberta pile 44°, half a mile distant; between the Naajeh and the Rumeylat canals the Nahrwan keeps a wary direction of 305°.

An abundance of water from the collected rains occupies the bed of the ancient stream. This, and the rich grass meadows that border on the canal, have invited a large party of *Niyadat* Arabs to the spot. Their black tents dot the grassy glades in various directions, and immense herds of their camels are seen grazing on the adjoining wastes, for they prefer the prickly thorn of the sterile portion to the soft herbage of the more

* عبر Abr, "a ford."

verdant soil. The tribe is a distant branch of the Daffafeh, but unlike them, they do not cultivate large tracts, but depend for a livelihood on the productions of their herds and kine, and on the "daym" crops, which are thriving well in this portion of the canal. We found them very civil, and their appearance, arms, and dress, bespeak an independence and wealth superior to any other Arabs I have seen to the South of Baghdad. Their Sheikh was absent on a hunting excursion, and though without any immediate controlling power, I found them as tractable as could be wished, for they readily sat down when I was observing so as not to shake the mercury in the horizon, which they did materially while moving about, and were otherwise disposed to forward our views by assisting us to ascend the pile and in measuring the breadth of the canal. In return I promised them a plentiful "daym" harvest—at least I said the sun predicted it: I could not be far wrong in my conclusions, for the crop was already plentiful, and they, simple-minded as they are generally, were pleased with anything that was in accordance with their wishes.

A few stones, scratched with some rude devices, and an earthen saucer inscribed with Pehlevi or Sabean writing, used in former ages for covering the mouths of Sepulchral vases, were offered for sale, but what I deemed an exorbitant price being asked, they were refused. The saucer, after depreciating its value, I secured, but the stupid fellow to whose care I consigned it, from a belief that my disregard of it was real, would not trouble himself with carrying it, and threw it away on the road, to my great annoyance, whereas my protestations of its worthlessness were only feigned, so as to prevent the Arabs supposing that we entertained any great value for antiquities.

Having refreshed our cattle with a three hours' rest, we again took the saddle at 9h. 10m. C. T. proceeding in the bed of the Nahrwan to Abu Simsim, a branch thrown off from the left bank. This we reached in forty minutes, passing a similar canal half way between our present station and the lower part of the Aberta ruins. From Abu Simsim, the pile of Aberta bears 289° 30′, and the direction of the canal is 84°, the direction of the bed of the Nahrwan onwards being 131°. Proceeding on at 9h. 30m. at a faster pace, still in the bed of the Nahrwan, in seventeen minutes ascended some elevated tumuli on the right bank of the canal, whose appearance in my opinion denote an age anterior to the other ruins we have passed. Of a greater height than

other mounds on the canal, they expose but few bricks thinly scattered on their surface,—a sign of the greater antiquity, for the buildings lie buried under an accumulated soil. The fort, or whatever occupied this site, formed a large quadrangle, each of its sides being about 500 yards in length. In the interior two deep and circular hollows resemble amphitheatres or the beds of artificial lakes, and at present the verdant appearance of their surfaces has a pretty effect when contrasted with the barren sides of the tumuli encircling them. The ruin is at present known by the name of Tel Tubbel, an insignificant modern appellation signifying the "mound of the drum." The few bricks seen are of larger proportions than those used in other ruined edifices on the Nahrwan, but we could not discover any character.

Leaving Tel Tubbel, a canal running in a direction of 115°, called Nahr Abu Kelb, and emanating from the left bank of the old bed, was passed. It is a mile below the former, and the Nahrwan takes a bend to the S. S. W. just below its entrance. At 22, 26, and 38 minutes distance respectively from this station, three canals that irrigated the country in a line of 225° and 193°, are cut from the right bank of the Nahrwan, and seven minutes further on a another canal left the left bank of the old stream. They all bear the name of Zahreh, and from the lower one Aberta bears 317° 30′; Kanatir 139° 30′; Rehkhameh, a high isolated mound, 123°; Mattalawi canals 154°; and the direction of itself is 112° 30′. Went on again at 10h. 48m. at a fast pace in a straight line for the Mattalawi mounds. At eleven minutes passed the ruins of a large town on the left bank, and in five minutes more the remains of piers on both sides of the old bed shewed that it was here spanned by a bridge. The town, if we may judge from the ruins, was of considerable extent, and the construction of the piers of the bridge is massive and neat. Singular enough, the Arabs have no name for these remains, or they had forgotten it, but I am told the ruins, by mutual agreement of the parties, mark the boundaries of the Niyadat and the Shammar Togh "daym" cultivations. I asked of the guide if the Government of the country had any knowledge of these territorial compacts, and whether they were ratified by authority? This was a signal for a deriding laugh from my Arab friends, and the Chief answered—"we never consult Pashas on the subject."

At the bridge, or rather at the spot where it formerly stood, I ascertained the breadth of the Nahrwan's bed as 105 yards; and at 11h. 12m.

continued our ambling pace, of 4½ geographical miles per hour, in a direct line for the Mattalawi branches, leaving the bed of the stream a little to the right of our course. At 11h. 30m. we stood on the summit of these mounds, which are on the right bank of the canal. Two other cuts are seen running nearly parallel with the eastern one, at a distance of a quarter and half a mile, to which my guide attaches the same name of Mattalawi. The bed of the Nahrwan from the old bridge continues in a S. b. E. and S. S. E. course to the western of these sister canals. It then becomes more serpentine than in any part of its course, for it winds to east and north, and back again to the south-east, and, passing the Mattalawi offshoots, continues its fantastic windings (which appear to have been designed for the purpose of breaking the force of the stream on the Kanatir works) a half a mile further to the north-eastward, and there a canal, bearing from this spot 14°, is cut from the left bank in a direction of 51°. The line of the Mattalawi canals is from 100° to 190°, and Aberta pile is seen bearing 323°, the station on the Zahreh branch being at the same time 334½°. A bend of the Nahrwan to the south sweeps back to within a quarter of a mile of our position, and the high mounds of the Kanatir conduits bisect 124½°. Avoiding the curves of the old bed, at 11h. 39m. we crossed E. S. E. to the bend alluded to above, and then pursued its direction, which was E. S. E. and S. E. At twelve, five canals were passed, which like radii are thrown off from either side of the Nahrwan from a bend which the old bed makes to the east, and at 12h. 15m. C. T. we encamped at Kanatir much fatigued; for what with riding, the frequent mounting and dismounting necessary to the observations at every canal, and the exertion required to scramble up the steep sides of the many artificial works, we had had a laborious day's march.

The carpets were scarcely spread, and the mules divested of their loads, than we had a good specimen of the innate disposition of the Arab for preying on his fellow-man, and appropriating to himself the property of others not akin to him. Hitherto we had been in the Daffafeh territory, and our guide being of that tribe, had strenuously urged my interference to prevent the destruction of the "daym" crops in the bed of the Nahrwan by the cattle we had with us, and whose owners, after we were asleep, had, to save the barley they had brought with them, been in the habit of allowing them to seek their food at will among the green corn of the tribe. Of course I prohibited the theft, and the

animals afterwards were prevented from straying, to the mortification of the muleteers and the satisfaction of my Daffafeh friend Daghar. We had no sooner encamped, however, in the Shammar Togh districts, south of the boundary I have mentioned, than the whole of the horses were turned adrift in the rich crops of the tribe, and had already commenced an extensive destruction. By threats I succeeded in withdrawing the cattle of the muleteers, but the horses of my Daffafeh guide and his son had their full fling, against all my remonstrances, until the morning, notwithstanding it was himself that had urged the injury done to his tribe on the preceding evening by the ravages of the beasts. I endeavoured to shew him the inconsistency of such conduct, but all I could elicit was, that the thievish character of the Shammar Togh made their property lawful to the universe. The Duffafeh were retorted on as worse than the Shammar Togh; but Daghar, little caring for the opinion of others as to the character of the tribe he belonged to, was only convinced that any loss it sustained affected him individually, while on the other hand, he regarded a successful larceny in which he was concerned upon the Shammar as an undertaking of which any one might be proud. With these ideas it was useless arguing any further, but recalling a promise that I made of presenting him with a saddle on the completion of the journey, had afterwards the desired effect: such is, however, Arab character, and so deeply rooted is the propensity for plunder, that it is inherent in his nature, and fostered by his early tuition. That, and lying, the worst vices of our social code, are viewed, indeed, by the Arabs as especial gifts, and are valued according to the degree of success attendant upon their employment. Perfection in them is considered talent, while the blunderer and unskilful may be classed as on a par with the illiterate and clumsy of the European community. The former comprise the influential and diplomatic body of the tribe, while to the latter is confided the care and conduct of the cattle and the camp.

The numerous immense canals thrown off from the Nahrwan in the immediate neighbourhood of Kanatir, would point out the district in which it was situate as a thriving and densely populated one, even did not the mounds on either side attest the fact. We have evidence, too, in a noble structure in the middle of the Nahrwan, of its people having attained a considerable skill in hydraulic science, and in the construction of works capable of resisting the force of an impetuous stream. On

either bank of the Nahrwan, at Kanatir,* solid walls of well-constructed brick gradually approach each other at their extremities near the centre of the bed of the old stream, and were connected by a dam, at right angles to them, of the same solid materials. Stone buttresses, at convenient and appropriate distances, support these walls ; that on the right bank being built parallel to it, while the left one forms a basin-like curve, having a solid brick rampart of 90 feet square at its extremity. On either side of the dam, sluices twenty feet wide admitted or controlled the supply of water to the south. The length of the side walls I ascertained as 870 feet, but that on the right bank has only 270 feet exposed, the rest being covered by drift-sand that has accumulated upon it. Both are of irregular elevation, from eighteen feet at the dam to eleven feet at their extremities, and the breadth of the eastern wall is in some places as much as seventy-five feet, particularly where it was connected with the massive rampart I have described. The opposite one, however, is but twelve feet in thickness, but where the buttresses adjoin, it attains to twenty-two and twenty-nine feet, and the space occupied by the dam is 110 feet, including the sluices at either end of it. The lower parts of these are considerably above the surface of the bed, and open high up upon the dam, shewing the water to have been generally at a high level. The dam, and that part of the side walls that was exposed to the action of the water, is ingeniously constructed to prevent the abrading effects of the boisterous torrents that had to be confined; and the former, supported by piers at its back, exhibits a firmly cemented and compact structure. Where the fall of the water impinged on the material, we see the bricks placed on their edges, as they would be fractured by its weight were the flat surfaces exposed to the shock ; and over the whole, to render it the more strong and durable, an artificial concrete, composed of fine lime and large pebbles, having in their interstices a minuter species, is spread, and forms a homogeneous mass, well adapted for resisting so destructive an element as the superincumbent water that found its way over the dam in the winter and spring freshes, and fell doubtless with a stunning force on the supporting piers below. The bricks used in the fabric are exactly one foot square, kiln-burnt, and so hard that it is difficult at the present time even to detach or break them. Independent of the Nahrwan itself,

* "The bridges," the plural form of Kantareh,—a name wrongly applied by the moderns to dams as well as to the bridges. The sketch and ground plan will give an idea of these works.

if we compare the material seen at Kanatir, and its adaptation to the great work it was designed for, in modern manufacture and modern engineering we have satisfactory but lamentable evidence of the great depreciation that the people and the country have undergone in a few centuries. Had the apathetic Pashas that have successively governed the country but paid a visit to this spot, and contemplated the work before them, they might have saved the State a considerable item of expenditure, and moreover have obtained a lesson in the construction of dams that would have benefited the country,—inasmuch as the crops that are annually swept away by the bursting of the paltry works in their vicinity would have been saved, and the oppressed people have been spared an endless amount of compulsory labor. The late abortive and vexatious attempts at damming the minor canals in the neighbourhood of Baghdad, though superintended personally by the Pasha, reflect sadly on the state of science in Turkish Arabia at the present period.

The purpose for which the works at Kanatir was designed, must now be considered, and it appears evident to me while examining the surrounding country, that the plains lying in the direction we have hitherto followed, the Nahrwan, have an increased dip immediately below the Kanatir works. In excavating the Nahrwan originally from the general level of the vast plains, it was, I suppose, unnecessary to do more than follow the natural channel the fluid was inclined to take, so long as it maintained a controllable career and answered for the irrigation of a large tract. This it appears to have done as far as Kanatir, but here an increasing declination would, if the stream were allowed a full latitude, have diverted its usefulness into an impetuous and destructive element. It was essential, then, to restrain its further passage in the direction it had previously taken, but at the same time to admit a governable portion of the fluid for cultivation, and for the support of life in the lower villages whose lands were disposed to invite it ; hence the obstruction we see erected here, and the utility of the sluices.

Further to support this view of the case, we see an opening on the left banks of the Nahrwan about 300 yards north of the work, equal in size to the Nahrwan itself, and running on a higher level than the bed below the dam. This must have received the greatest portion of the stream, and I presume, therefore, it was the continuation of the originalNahrwan that is represented by the Arab MSS. to have flowed to the S. E. of Badrai;

while the deep bed below the dam, bearing the name of Nahrwan at present, I conclude to correspond with that portion of the canal that is described by the Arab geographers as to have been last in operation, and whose limit extended to Jumbil, and subsequently, on its decay, as far as Jarjariyeh only.* The more northern opening that I have described is named by the modern Arabs Shat Freyeh.† They describe it as extending to the S. Eastward as far as a place called Karail beni Syed, in the direction of Badrai; and if this branch were really the continuation of the Nahrwan, the destruction of the dam, either by violence or by neglected repair, admitting the water unrestrained into the low country, will fully account for its early obliteration, and the extinction of its proper name, as that would naturally attach itself to the arm that was longest in existence.

The works at Kanatir, indeed, must be regarded as types of the energy of the period, for in addition to the skilfully raised dam, we find excavated channels of considerable depth and extent for dispersing the waters over a large space. These, emanating from the Nahrwan, are disposed in well-arranged ramifications to the North of the dam, and shew that the supply in the Nahrwan by means of the fabric, was copiously maintained at this spot, otherwise so many absorbents could not have been provided for. Those immediately north of the obstruction, and intermediate between it and the opening of the Shat-al-Freyeh, have also well constructed dykes across their entrances, for regulating the desired amount of water, and appear to me to have been used more as discharge-valves than as irrigants, when any extraordinary pressure threatened the safety of the structure beyond. The embankments of these lateral ducts are the highest objects in the country, and at Kanatir the mounds forming them attain a greater elevation than in any other part, for here they rise between 70 or 80 feet above the level of the adjoining plains. To an experienced observer, indeed, it seems surprising that these offshoots should be girt in by such formidable embankments, while the great artery from which they derived their supply is bounded by insignificant margins, scarcely exceeding in any part of its lower course the level of

* See quotation from Yakut's epitome, p. 257.

† Shat شط signifies "river," but I cannot find a meaning for Freyeh, unless it be a derivative from the Arabic فرى implying "rent," a "burst." In this case, were the meaning literally adopted, it would overthrow the theory I have advanced, and the destruction of the Nahrwan would be then attributable to the opening of the Shat-al-Freyeh. The old records, however, describing the Nahrwan's original limit as extending below Badrai, would incline to the view I have taken.

the contiguous districts. The course, however, of the great conduit through the country, being in the line of depression of its soils, gave a rapidity to its stream that kept it at all times free from deposits; while that of its lateral ducts being slightly at variance with nature's laws, caused impediments to the free passage of the fluid; and sedimentary deposits, had they not been speedily cleared, would have destroyed their utility. To the constant dredgings they underwent, and the accumulation of the abstracted matter year by year, therefore, must be ascribed the lofty eminences that flank them. From the summit of that adjoining the dam I obtained a good view, and the following angles by theodolite, set 360° to the minaret of Aberta,* were obtained:—

Direction of the Nahrwan...	356°	18′
Fort Shammer on the Tigris...	281	40
Tomb of Zajal-Arafan...	278	2
Baghdadiyeh Fort doorway...	276	30
Meyahh canal...	201	17
Aghab mound and canal on right bank...	193	00
Sumakeh ruins on left bank of Nahrwan...	191	09
☉ near limb for Azimuth†...	162	08
☉ altitude lower limb for Azimuth	14	55
Rekhameh mound...	82	6
Direction of the Shat-al-Freyeh, approximate...	143	30

I obtained also a good meridional altitude of α Canis Majoris as 80° 46′ 08,″ ‡ making the latitude of the dam 33° 6′ 49″ North.

Leaving Kanatir at 3h. 35m. C. T., and going at an amble of 4½ geographical miles per hour, we reached the high mounds called Sumakeh at 4h. 10m. These consist of ruins on either bank of the old stream, so thickly heaped together as to become a wilderness of brickwork extending from Kanatir to half a mile below the spot we were upon, and inland about three quarters of a mile from the margin of the canal. The mounds composed of the ruined edifices are at least 50 feet high. I consider Sumakeh to have been the most extensively populated city or cities on the whole line of the canal, and, from the circumstance of both banks exhibiting nearly an equal amount of remains, I am inclined to

* On protracting the work subsequently, it appeared that I had mistaken some other object for Aberta minaret, some heavy clouds being in the direction, and from the distance it was off, I am convinced it could not, under the circumstances, have been seen. The error will, however, only affect the bearing of Aberta; all other places will have their relative angular value with each other, and the position of Kanatir is determined independent of the mistaken object.

† 7th March, 1849. A. M.

‡ 6th March, 1849. P. M.

view the locality as the site of Askal-beni Joneyd* of the Arab MSS. From Sumakeh two high isolated mounds on the plains to the east, said by the Arabs to be on the banks of the Shat-al-Freyeh, and named Mesrur-al-Freyeh-kebir and Mesrur-al-Freyeh Saghir, were observed as 52° and 68° by prismatic compass. Between Sumakeh and Kanatir some remains on the margin of the Nahrwan led me to the belief that the stream was here spanned by a bridge, for some massive portions of brick resembling piers were distinct enough. The Arabs of my party, though looking at the vestiges with astonishment, and evidently absorbed in considering the past and present state of the land they now occupy, console themselves for the loss of its streams and its pleasant fields with the reflection—that the race who inhabited the fallen structures, and the hands that raised them, were an idolatrous spawn, justly swept from the face of the country by the sword of the true believers. The universal and unsatisfactory era, termed by the present miserable occupants Ayam-al-Jahiliyeh,† or " the days of ignorance,"—the period prior to the rise of Mahomedanism,—is, by the Arabs, and with justice too, given as the epoch of their prosperity ; but it was, I confess, somewhat sickening to hear my ragged companions harping upon the prowess of their ancestors, whose influx had put a stop to activity, and changed a country of universal plenty into one of poverty and desolation. The offspring of the locust was indeed beside me, and in contemplating the peculiar structure of its nature, I was not at a loss to account for the blight and desolation around me.

Left Sumakeh at 4h. 30m. and continued in the bed of the Nahrwan, whose banks are now much broken and somewhat lower than the country on the left bank ; from these uplands, the stream must have received considerable contributions in heavy rains, and a proof of the greater declivity of its bed here is the collected rain of winter lodging in this part, whereas above Kanatir, excepting at 'Aberta, we could not

* Refer to page 235 of the preliminary remarks, and note of the same page.

† A period, according to the illiterate Arabs, extending from the creation to the birth of Mahomed, at which time true knowledge was first given to the world. The latter event is designated by these bigoted people as the " era of light," and though the darkness it spread over the previous glory of Asia is palpably visible to the eye of the believer, still the sense is fettered with the conviction that no good existed prior to the advent of the great reformer of Arabia. The paradoxical faith of the Arab, indeed, is a peculiar one, and referable, in my opinion, to a singular organization of mind that will not admit of free agency as far as his doctrines are concerned. In all other respects he is the child of impulses, lawless in his actions as ungovernable in his passions, hating and yet confiding ; proud and mean alternately to a degree, he still claims our respect as a being who, amid universal change, has alone retained an integrity of character, bad though it be, and a singular adherence to the primitive habits of our race.

find a single pool. Here a good supply exists, though no rains of consequence have fallen for a month, and the wild fowl in consequence congregate near the spot. We saw many ducks, a few snipe, and some hubara.* A large wild cat, too, named by the Arabs "Bazun-al-Bir," was chased among the ruins, but soon earthed itself in one of the numerous holes with which they abound. At 5h. 12m., the course of the Nahrwan trending more to the south, we left its bed and rode over the fine plain direct for the mound termed Meyahh, having passed at 5h. 5m. a branch canal from the left bank named Nahr-al-Reshid, that takes an easterly direction; another similar one on the right bank that watered the country in a line of 183°, termed Aghab, being a mile distant. Its bearing is given from Kanatir. At 5h. 53m. arrived at Meyahh, a high mound situate at a point where a large canal coming from the N. N. W. (probably from the Nahr-al-Reshid) bifurcated. The true direction of these are given in the following angles taken by Theodolite set 360° to the mast-head of the *Nitocris* at anchor at Branej on the Tigris, and whose signal flags we have just now descried on the distant horizon. The observations are indifferent, for the sky suddenly became obscured, and a partial rain fell at intervals that prevented a good latitude being obtained. The approximate meridian altitude gave it as..... 32° 59′ 45″ N.

Kabr Harbi.....				333	23
Sumakeh....				135	8
The line of the Meyahh canal to			the North...	145	00
do.	do.	do.	its Eastern fork...	300	00
do.	do.	do.	its Western do...	341	00

The *Nitocris* at the same time being, by prismatic compass, 202½°, and the Nahrwan's bed west of the station one mile distant.

At 6h. 47m. C. T., quitting Meyahh we kept a direction of S. S. W., and soon met the bed of the Nahrwan. By this time a brisk rain had set in and rendered everything indistinct. The line of the canal is, however, nearly straight in this part, and continues so to Imam Imlikh, where I left off the examination on my last visit. Half a mile north of Kabr Harbi, just above the canals that leave the Nahrwan in this vicinity, the remains of brick buildings were observed on either side of the canal. Passing these we encamped at Kabr Harbi, on a wet afternoon, but a N. Wester clearing the atmosphere towards sunset, I was

* A species of bustard,—of very fine flavor, and a favorite bird among the hawking community of Arabs.

enabled to obtain the following angles by Theodolite, 360° set to the *Nitocris's* mast-head in her former position on the Tigris :—

Humaniyeh minaret in Mesopotamia	327°	21′
High part (station) on Meyahh canal	123	18
⊙ Upper limb for Azimuth*	0	52
⊙ Near limb for ditto	32	04

And thus the portion of the canal S. E. of the Diyaleh River, and the part to which the name of Nahrwan was in ancient times applicable only, is completed.

March 8th.—Struck the tent and made a start for the vessel, over a country that has been flooded from the neighbouring marshes around the old christian city of Deir-al-Akul. We passed just to the south of the fantastic water-course known as the Shat-al-Sheyleh spoken of on my former visit, and without seeing anything worthy of notice beyond the extreme desolation, in an hour we reached the mounds known as the Qubbeh't Dokhaleh* on the East bank of the Tigris. From thence, finding the ruined mounds of Deir accessible, the marsh generally surrounding it having dried up, we went on to examine the vestiges of the interesting city, and in another hour ascended the mounds that enclose its venerable buildings. The town must have been of great extent. At present I estimate the diameter of the space covered by their ruins at 1000 yards; immense bricks, pottery, and broken vases, in great abundance, are strewed over the surface of the mounds, which are of considerable elevation, though from the Tigris they have an insignificant appearance, the ground on which they are situate being the bed of a vast alluvial basin, considerably lower than the banks of the river. I have at various times attempted to reach these ruins, but have been disappointed, from the swampy nature of the country encircling them. Last year, however, owing to the Tigris not rising to its usual height, the marsh was left without its supply, and was soon absorbed. Deir is the name these mounds at present bear among the Arabs, but the geographers and historians write it as Deir-al-Akul, "the abode of the camel-thorn," from its being a favorite locality of the plant. The dry bed of the marsh is now thickly spread over with the annoying but useful shrub, and caused great irritation to our horses' feet as we came

* March 7th, P. M.

† In endeavouring to give the proper orthography, and sound of Arabic names or words commencing with ق—I have at times substituted the q. for the deep k, in order the better to convey the crow-like sound of the Arabic letter.

along. The term Deir was originally applied, I believe, to the early nunneries and monasteries founded by the Christian Arabs; and in those primitive days of Christianity, Deir-al-Akul was a celebrated abode of sanctity and learning. A quadrangular line of mounds, enclosing a court yard, in the centre of the ruined town, will, perhaps, indicate the site of the convent in which the pious sisters were immured; stained glass of a superior manufacture was observed in many places, and some copper coins, too much corroded to decipher either legend or figure, were obtained by turning up the bricks on the surface of the mound, but not without risk of being stung, for large and venomous black scorpions were disturbed in great numbers, just recovering from the torpor they had existed in throughout the winter.

The Theodolite gave the following angles from the highest mound, on March 16th, on which day I again visited the spot, the former being hazy and few objects discernible—the instrument set 360° on the fort of Baghdadiyeh:—

Magnetic North	304°	00′	00″
Taj tomb	7	56	00
Kabr Harbi	120	31	30
Sun's near limb for Azimuth	155	55	00
Sun's altitude lower limb	6	58	00
Humaniyeh minaret	175	37	00
Sheymiyeh mound	179	52	00
Fire Temple at Humanyeh	230	26	00
Centre of Sheikh Fahal's Fort	316	14	30

And the Meridian Altitude of the sun on the former day (March 8th, 1848) was observed as 104° 2′ 50″, making itslatitude 32° 51′ 54″ N.

Erecting a pile from the fallen bricks, and placing a large tamarisk bush in its centre as a conspicuous mark for further observations, served to wile away the hours I was necessarily delayed for the noon latitude. The Arabs readily entered into my views, and all lent a hand in its construction, their usual dislikefor labor of any kind being overcome by witnessing myself employed on the task. One by one they came, and assisted in the building, and in a short time I had raised it as high as I required, the Arabs the while singing to their labor in united chorus. Had I asked their services for the menial purpose of carrying old bricks, their would have been denied, or would have been begrudged, and I merely relate the circumstance to shew how soon these children of impulse may be brought to aid in any purpose by example,

and by a good-humoured indulgence of their natural caprices. When neither goading or money will secure the ends in view, these seldom fail, while on the other hand, intemperance and haste serve only to widen the breach, and perhaps will end in mutual bad consequences. When the pile was finished, the usually grave "lion," at his own request, was assisted on to the top, and drawing his sword commenced a song and a caper that would have been worth a fortune to Catlin of Red Indian notoriety;—the rest accompanying him in dot-and-go-one gyrations around the fabric, brandishing their naked weapons as in the sword-dance, and vociferating in horrible cadence an extempore song at the full capacity of their lungs.

The latitude obtained, we turned our footsteps from the hallowed spot, and made the best of our way to the vessel now on her way up the reach of the Tigris to pick up the party, and in half an hour were again exchanging salutations with our friends and shipmates.

Having thus disposed of the Nahrwan proper, I became anxious to trace the main conduit North of the Diyaleh, which at the present time erroneously bears the same name; but which in early times possessed the discriminative appellation of Katul, and was further distinguished by the affix of the royal title "Al Kesrawi" of the Sassanian Kings.* An opportunity was afforded shortly after my return from Basreh. Equipped therefore with my usual surveying apparatus, and, with the exception of Sheikh Subba, having nearly the same party as before, we left Baghdad on the 24th March. A few days previously the fine spring weather had been succeeded by a heavy South gale, that was attended by clouds of impalpable dust, and an oppressive heat, that, as we anticipated, soon caused a rise in the waters of the Tigris by thawing the masses of snow reported as more than usually deep at the foot of the Taurus, and on the mountains of Armenia and Kurdistan. Two days of such weather after the fine cold we had experienced, sufficed to convert the usually placid stream into an impetuous roaring river. As early as the 22nd March its average annual height had been attained, and on the night of the 23rd the pressure was so great upon the "bunds" to the North of the city that they gave way. The still rising waters thus found a vent, and the country in a few hours lay some feet deep in water. By noon on the 24th the flood had reached as far South as Gherareh, and in an hour or

* Making "Katul-al-Kesrawi." See also preliminary remarks.

so threatened to surround and isolate Baghdad itself, by a junction with the waters of the Diyaleh. With great difficulty, therefore, we escaped from the city before this took place, for we had to make a long detour through bog and water before we cleared the lower grounds. The authorities, the troops, and the townspeople, in alarm for the city, and its communication with the adjoining country, are all now actively engaged, Turk-like, when too late, in attempting to stop the further progress of the flood, by hastily-constructed dykes that should have been erected before, and the Arabs of our party are in considerable fear of being seized to aid in the works, which would certainty be their fate if not in attendance on myself. As we pass, we witness the forcible detention of those who, having business in the city, were, unfortunately for them, on their way to the gates, and many an appeal is cut short by a blow of a truncheon, or the butt of a soldier's musket : but in commiserating the fate of these detenus I am wandering from my subject.

At 4 P. M.* we had got into the open country, and some extensive ruins, called Dhubbai, gave us a good view of the progress of the flood. In a single night the whole face of the plain as far East as this had been transformed into a vast sea, and the mind, formerly at a loss to comprehend how the great works of antiquity had been swept away, became at once aware that successive floods, caused by a neglect of confining the rivers within their limits, had been the destructive element that had levelled them. As in this instance, where the ruined edifices have been heaped so as to form mounds, the traces of the canals that watered the town can be plainly distinguished, but beyond them are entirely obliterated. I presume it to have been formerly a suburb of Baghdad, and doubtless, surrounded as it must have been by magnificent gardens, was a favorite retreat of the more wealthy and luxiriant citizens. From these ruins, the old minaret of Suk-al-Ghazl in Baghdad bears 245° 15′, and the shrines of the Imams at Kathemien 276° 45′.

We now kept a road called Durb-al-Sidareh over an uninteresting and barren plain. In 40 minutes an ancient canal, now called the Tabur, was crossed. Its line northwards is 12°, and southwards 188°, and Khushm-al-Khor bears from our station on it 105°, Sifweh 61°, Baghdad, and the road we came, in one, 243°, Kathemein 265°. This canal emanates from the lower Katul, or, as it is called by some,

* On this journey the true times are given in the journal, as a pocket-watch was carried in addition to the chronometer.

the little Nahrwan, and two others are observed diverging from the Tabur, one on the left to the SW., the other to the East in a direction of S. by E. ½ E.—Continued our previous course at 5h. 30m., and encamped on the right bank of the Diyaleh, opposite, but a little North of Sifweh. The following bearings will determine the spot:—Sifweh 29½°, Abu Drug* 141°, Baghdad minaret 240°, direction of the Diyaleh to the north 318°, a curve of the Diyaleh 33°; another 186°, about 2 miles distant, and the bend of the stream to the North of Sifweh 71°; ⊙ centre at setting for variation 275°.

The night was dark, but very brilliant with stars, and sleeping in the open air as we did, the cold was anything but pleasant. A good fire was, however, made after some difficulty from a scarcity of wood, and our Arabs, scantily clothed as they were, preferred passing the night in conversation around its embers to seeking a disturbed sleep in the cutting wind. At a distance, comprised as the party was of Kurds, Arabs, and Baghadis, the features of the group, lit up as they were by the flames, formed a fine subject for the artist, and the good-humoured countenance of our friend Syed, an old and grisly-bearded negro, who had spent his life in Bedouin camps, and had prepared for three parts of a century the universal beverage of the Arabs, glowing at the different tales, exhibited in silent delight a set of white teeth that acted as a fine contrast in the scene. The droll and inimitable expression of his half closed eyes made Syed, with his coffee pot, a welcome visitor at all times, and the juice of the Yemen berry expressed with a consummate skill, and savoured with the comic physiognomy of the artiste, became henceforth denominated by a brother negro, who spoke a little English, by the not inapt name of "tickle-belly," for its presentation, and genial effects, like the risible gas, generally produced an immediate fit of laughter.

Pursuing our journey at 6h. 35m. the following morning in a direction of 18°, we came upon the bed of a stream in 25 minutes from our starting point. This was observed coming in almost a straight line from a point marked as 30° by the prismatic compass, and is doubtless a continuation† of the more modern and Southern Katul, the main conduit

* Tomb on the left bank of the Nahrwan, noted on my former journey, and pronounced indifferently Drug-Drug or Druk.

† On the journey made in September 1849, noticed in note page 242 of the preliminary remarks, I found this irrigant to be a branch only of the Katul, which conduit crossed the present bed of the Diyaleh, and is traceable in a line contiguous to the Katul Kesrawi on the East of that river.

that irrigated the lands lying between the Katul-al-Kesrawi or Nahrwan, and the river Tigris. The Nahrwan itself is seen immediately on the opposite bank of the Diyaleh ; so we may presume that the latter stream, on resuming its natural course to the South after the decay of the canals, was confined to the space immediately between them, their embankments on either side offering sufficient obstacles to a diversion until it reached beyond the turning point of the Nahrwan below Sifweh, when we see it assume a S. Westerly course no longer controlled by the artificial works on either hand. It is now about 200 yards N.E. of our present station. The bed of this canal, which I shall term the lesser Katul, here takes a bend to the west for a short distance, and after throwing off the irrigant called the Tabur (see yesterday's journal,) is said to be lost at a place called Khirr-al-Sifin on the Diyaleh. This spot, though having a modern name, was doubtless the farthest limit of the lower Katul, for immediately South of it we see the lateral ducts from the great Nahrwan come into full operation, and were prolonged as far as the Tigris itself, watering on their passage Ctesiphon and the towns adjoining that capital.

Leaving the small portion of its course unseen to the South, I now determined to follow up the bed as far North as possible, proposing at a future time to complete it, as well as the continuation of the Nahrwan between Sifweh and Bakuba, on the opposite side of the present course of the Diyaleh. Accordingly at 7h. 10m. we continued in the bed, which is here neither deep nor wide, but bears the appearance of an irrigant that has been attenuated to its limit of action. In 20 minutes we came upon a branch that left its right bank, and extended into the country in a line of $245\frac{1}{4}°$, and the shrines of Kathemein are seen on the same bearing from a mound at its mouth that bears the name of Tel Abtor. We now observe the bed of the lesser Katul above this duct attaining an increased breadth, but, like the whole of the large conduits, whose lower portions flow through alluvia, it bears all the characteristics of a natural stream ; and we may presume, therefore, that the gentle windings the waters of the canal have followed, were originally marked on the face of the country by accumulated rains, whose general direction being parallel to the dip of the surface, would of course be the line of conveyance of the greater body, while the larger of the rills or streamlets, that branched in accidental depressions at variance with the

other, would serve to denote the direction that the lateral cuts should pursue. Aided here and there by artificial embankments, the scarcely perceptible but natural furrows have doubtless guided the designer of these works in conducting them through the softer soils, and the sinuosities I have spoken of are readily explained. The bed is now about 40 yards broad, and the following observations obtained from Tal Abtar will give its position :—

Tel-Kidri 6° 00′—this is another mound at the head of a branch canal from the lesser Katul; Khani-beni-Saad 344° 30′—on the road to Bakuba; Minaret of Baghdad 228° 30′; Abu Arug, on the Nahrwan, 171° 00′; Habesh tomb 57° 30′.

Proceeded at 7h. 50m. in a waving direction from 19° to 10° in the bed of the canal. At 8h. 43m. we stood on the Kidri* (Khudreea of Lieutenant Grounds' Map) where it left the lesser Katul, and an opposite branch coming from a line of 30° into the left bank of the canal, at once proclaims the latter's connexion† at this spot with the Katul's on the other side of the Diyaleh. The Kidri is a large duct that appears to have watered the whole of the country to the N. E. of Baghdad in the flourishing era of the province. A large mound is a conspicuous object at the head of this old irrigant, and from it I obtained Khani-beni-Saad as 320°, direction of the lesser Katul's bed 14°, direction of the Kidri's junction with the Nahrwan, now broken in upon by the Diyaleh, which is 300 yards distance, 30°; its opposite line of bearing is 220°; Abu Khomeis, a tomb on the Khorassan canal, 49° 45′; Habesh, another tomb, 120°. Our course to this spot back 178° waving. From the Kidri the country to the North becomes more elevated, and the alluvium is lost under the superincumbent strata of loam and marl, particularly manifest in the deepened bed of the Diyaleh, the cliffs of which bounding it on either side now confine its meanderings through a well-formed valley.

At 8h. 55m. continued our progress to the Northward on the course given above, and from this time until our arrival at Al-Fethha at 10h. 30m., the East bank of the lesser Katul was in close proximity with the westerly bends or turns of the Diyaleh River; the canal at times even be-

* This is the name my guides would persist in calling it by, though I suspect the other is the proper term.

† This affords ample proof of the non-existence of the Diyaleh in its present course, while these canals were in operation.

ing quite obliterated by its encroachments. At this station the lesser Katul assumes its character as an artificial work, which, considering the superior elevation of the country, is in accordance with the design. The bed becomes straight and deep, and the embankments are well marked and continuous. Divergents on either side, as in the greater Nahrwan, here shew that its maximum point of usefulness was attained as a conduit, for although a few lateral ducts emanated from its right bank to the North of Al-Fethha, by far the greater number are to the south, and a large opening at this spot, now pointing across the Diyaleh, marks its having been connected with the Katul's on the opposite side of the stream.

From Kidri to Al-Fethha the banks of the canal shew traces of ruined habitations, which, though faint from being immersed in successive inundations, by their extensiveness point to the locality at one time as a very populous one. At present nothing is to be seen but a solitary caravan that has arrived thus far on its way from the interior of Persia to the holy shrines of Nejaf and Kerbela. The load that the weary beasts carry is typical of the aspect of the once animated soil, for, slung like panniers on either side, they bear, in ill-constructed coffins covered with a species of coarse carpet, the decayed relics of the fanatic race that inhabit that country, for interment in the *blessed cities* that contain the bones of the martyred 'Ali and his ill-fated progeny. This posthumous journey to the great Necropolis of the sect, is imagined by the credulous Shiah as ablutive of all sin, for (like in chemical affinities) it is believed the mingling of the ashes of the sinner and the saint precipitates the impurities and evolves a purified essence acceptable in the paradise of the Moslem. Beside the dead, there are others nearly allied to them, if we may judge from thier emaciated and travel-worn appearance, on pilgrimage to the Mausoleum of the Imams, having walked more than a thousand miles on foot to reach the haven of absolution, being too poor to pay the expense of an animal for the journey. The caravan proceeds at its measured pace, with the coffins swinging to and fro, while the bones of the dead inmates, clattering to the step against the boards that confine them, awaken the still air with their horrible discord, and must sound like a knell to the lagging and foot-sore zealots that accompany it, and whose appearance is in painful contrast with that of the sturdy muleteers, who either bestride the corrupt-laden animals or walk along singing at their side: like resurrectionists, indeed, these latter look on the

scene as a professional one, and to display humanity would evince a weakness detrimental to their calling. It has passed onward, leaving, methinks, a morbid trail on the rich grass that now carpets the bed of the canal, and we bivouac too in a part uncontaminated by its progress. While I had gone to the summit of the mounds, one of the party, to procure water, descended the steep bank of the canal that is cut away by the Diyaleh. His astonishment was great on arriving at the margin of the stream to find a man in a garb foreign to the country, lying quite exhausted in a shaded part of the cliff. He was roused with some difficulty, and brought helpless and gasping to our sitting-place. After we had fed him on rusk and dates, and thus recovered his strength a little, he proved to be a Herati follower of the carravan I have spoken of, and had been four months from Herat on a pedestrian pilgrimage to Kerbela. He was evidently in the last stage of exhaustion, principally from fatigue and starvation, and the inhuman muleteers, callous to his previous sufferings, from these causes had not only refused him a ride, or a particle of food, but had left him here to die, or to reach Baghdad in the best way he could in the event of survival. Despatching a horseman after the caravan, it soon returned, and I then formally made over the miserable pilgrim to the chief of the party, threatening to bring his conduct to the notice of the authorities if he did not carry him in safety to the city. This had the desired effect, and we had the satisfaction, after replenishing his wallet with bread and dates, of seeing him fairly mounted on the back of a mule, en route for the city. From Al-Fethha the following bearings were obtained :—Bint Al Husseyn 170°, our course latterly to this 182½°, Khani-beni-Saad 235°, direction of the lesser Katul and our course onwards 14° : the meridian altitude of the ⊙ was also observed as 115° 56′ 00″, and its latitude is therefore 33° 36′ 45″ North. A beautiful species of scarabœns, with a gold-spangled back, was observed here. It is not found, I believe, in the alluvial districts.

We re-mounted at 2 P. M., and continued in the bed of the canal, which, above Al-Fethha, is much broken by the encroachments of the river Diyaleh. Our course has been as near as possible 11°, without anything worthy of note, but at 3h. 30m., after carefully tracing the canal over and beyond the broken places, I had the satisfaction of observing its connection with the large and deep conduit, known as the Katul or Gatul of the Arabs of the present, days which is now seen ex-

tending from this in a perfectly straight line of 343°, and the following places bear respectively from our position as follows: station on Al-Fethha 190° 45′, Abu Khomeis 161° 00′, Weiss, a tomb, 167°, Qubbeht-al-Leyl 128°, Bohriz, centre of the grove of, 56° 30′. We now galloped in the latter direction over a fine plain, and in a few minutes stood on the banks of another splendid work, similar to the lower Katul in appearance, but really the original one of that name, with the further designation of "Al Kesrawi," the royal title of the Sassanian monarchs. As before mentioned, the old name has lapsed to the more recent work we have just quitted, and by the ignorant tribes now occupying the country, that of Nahrwan has been substituted, and with some reason, for it was the great artery from whence the Nahrwan derived its current. From motives that I have given in the preliminary remarks, I shall continue to call it by the name it is at present known by, in the journal of its survey, but with a desire to revive and perpetuate the antiquated title as written in the Arab MSS., it will be styled Katul-al-Kesrawi in the map. The work, indeed, is worthy of the royal distinction, and dried up as it now is, its bed offers, after traversing the arid plains that adjoin it, a good comparative field for contemplating the past and present history of the land. The traveller, wearied with the monotonous picture presented to his eye, as hour after hour he scans the same flat and desolate prospect, broken only by remnants of canals that, like sterile islands in a frozen sea, serve but when first viewed to relieve the langour that is felt,—is suddenly aroused from his conjectures regarding them, by seeing beneath his feet, in a straight and continuous line, the source from whence they emanated. The excavated bed, 150 yards broad, and at the present time about thirty feet below the level of the contiguous land, with embankments of the same height above the soil, would mark it as the channel of a deep and rapid stream, constructed in a prior age when labor was compulsory, and when a monarch's will was the despotic call that assembled the masses then comprising the population of this once favored reign. Elevated above the country on a conspicuous mound forming a part of its embankments, the traveller in his imagination calls to life the scenes enacted at various times in the neighbourhood. He pictures to himself the healthy verdure that carpeted the barren tract before him, and the numerous silver streams that gave being and vigor to the umbrageous trees that doubtless adorned the country embraced by his view. The

landscape is further diversified with mansions and cottages, with flocks and herds, and his lively imagination can distinguish, as it seems, the activity and hum of the industrious race that occupied it. Over a massive bridge that spanned the royal stream at a distance from where he stands, he conjures up a panoplied array of foot-men, horsemen, and elephants, under the personal conduct of the great Anushirwan, on their way to conquest or to avenge themselves for national injuries on the Christian States of the west. And as the pageant flits by, the mind reverts to the voluptuous era of the monarch's grandson. The rustling of silks, and the lively strains of music, are broken by the impatient whine of the greyhound, as the glittering throng attendant upon Khusru Parviz and his beautiful Shirin press forward on their excursions of love and the chase; and while contemplating the altered manners of the court and the people, in their descent from warlike habits to effeminacy, a cloud is seen in the south that casts a dimness over the sunlit picture, never to be effaced. A wild and half naked race, scarcely heard of before they emerged from the deserts that had nurtured them, mounted on their swift steeds, convert the pleasant prospect that is being considered by the traveller into one of horrible disorder. The altars and the sacred fires that have been preserved for ages are thrown down and extinguished; blood flows commingling with the streams; the wailing of the vanquished is heard above the din of battle and the Allahu Akbar of the victors. The Arab, the sword, and the Koran, and in their train, pestilence, famine, and a sudden death, lie like incubi on the land, and the beautiful vision of the past at once resolves itself in all its naked deformity, to the gaze of the visionary, who recalled from his trance, cannot help pitying the descendants of the locust brood now squatting at his feet, and wondering at his past abstraction, for in them he thinks he sees the instruments of some wise design that has not yet even been accomplished.

The following bearings were obtained at the station:—Al Fethha, 192°; Abu Khomeis, 166°; Qubbeht-al-Leyl, 150° 30′; and the direction of the Nahrwan, 345°. We now proceeded in its bed, which we observed to cross the line of the Diyaleh to the south of us, and at 5h. 10m. the course we had come was taken back as 167° and onwards 338°. We are now opposite the date groves of Howeydeh and Khanabat, situate on the east of the Diyaleh, which river has of late encroached on the canal, and swept its east bank in this part en-

tirely away. The right bank is yet perfect, and, meandering from side to side in the ample bed of the old canal, is observed, as if in mockery of it, a rill from the Khalis canal that a few miles above severs the antiquated conduit in the direction of its several irrigants. After twenty minutes' halt to allow the party to close, we continued our route, and in fifteen minutes more the remains of some massive brick piers on the banks of the canal point out where a bridge had been erected, and some mounds on the east bank denote the situation of a contiguous town. At 6h. we encamped on the banks of the canal with Khanabat grove bearing 80°, Kalaa village 344° 00′, and Aswad date tope 310°, about $\frac{3}{4}$ of a mile distant.

The following morning we continued our progress, but were soon compelled to leave the ancient beds, for from Aswad to Khan Nahrwan, the Khalis cultivation, and a branch derived from that canal, named Tahwileh, have obliterated them. On the north of the Khalis, other derivatives from it in like manner traverse both the Nahrwan and the Katul. These are named in succession, the Saadyeh, the Jedideh, the Alibat, the Jezani, and the Sindiyeh. Skirting the villages and groves of Deltawah, and the lower Jezani, we passed the Khalis, and the several canals I have enumerated, by ill-constructed and dangerous bridges of loose wood and earth. Wading through swamps and around garden walls, a true course of our progress could not be recorded. These places are, however, sufficiently well determined by our present observations to shew their positions with regard to the ancient works in their vicinity, and for the present they are left, with the intention of ascertaining them more correctly at a future period. Everywhere around these villages there is abundance of cultivation and well-watered gardens. The wheat and barley waving to and fro, is a great relief to us after our barren ride from the gates of Baghdad.

We halted in the bed of the Katul close to Khan Nahrwan, a place of accommodation for pilgrims on the road to the shrines at Samarrah, at 9h. 45m., and spread our carpets on the rich grass with which it is clothed, to await the noon-day observation of the sun. In the mean time I received a visit from Ibrahim, the Sheikh of the old tribe called the Beni Tïmim, now located on the waste lands north of the Nahrwan, between it and the Atheim. Originally from Nejd, this portion of the tribe has long since occupied this part of the country, but poverty has compelled it to put aside the pride of birth and pedigree, though it still

boasts, in retention of the name, a connection with the old stock. The fine old man was very civil, and purposed going off to his camp to place a relation of his at my disposal as a future guide, for after leaving the Khalis, the cultivated districts and partial civilization is exchanged for barren wastes and predatory tribes that, if not in open rebellion, are at variance with the government of the country. The Englishman, however, so long as he conducts himself with propriety, and respects the prejudices of the singular people he is among, is a welcome guest in the camps of the nomades. Though of an opposite religion, and of an opposite character, he meets from them generally, especially when known, as much courtesy as their habits can bestow; while to the Osmanli, and indeed to all around, they are either avowed enemies, or at best but distrustful companions. Being so is not so much a trait of character in the Arab, but must be ascribed to the system that has been adopted to bring him under government—a system which, answering the desired motives for the time, is characterised by treachery and faithlessness, and in the end fails in securing him as a willing servant of the state. New devices are then studied to entrap them. With some they take effect, while with others they are regarded in their true light as machinations, only to last so long as suspicion may be lurking in the mind of the wary and more shrewd. When this has ceased, the cloak is withdrawn, and neither plighted word, nor oath pledged on the sacred Koran, will save the confiding Arab from the vengeance of his oppressor.* There have been occasions when severity was doubtless called for, but I still think the rapacious Osmanli has originated them by taxing the tribes to an extent beyond their means; while at the same time, from a selfish penuriousness, he has not a fitting force at his disposal to keep them in check, and to enforce the law upon the refractory. This has caused mutual hatreds, and mutual deceits, and a resort to every artifice on either side is the result only of a nefarious system practised by a Government that has neither the moral nor the physical power of controlling its subordinate officers and subjects.

Another digression. But noon has now arrived, and accordingly the latitude of Khan Nahrwan and the southern bank of the Katul on

* The fate of Sofuk, the hereditary chieftain of the most powerful tribe in Mesopotamia, will remain as a lesson to the Arab for some time to come. Though the Sheikh deserved death for his many offences, both against Government and against the rights of hospitality, yet the system employed to compass his death, by assassination, will ever remain as a blot on the character of Nejib Pasha.

which it stands, is obtained as 33° 52′ 43″ North,* from the meridian altitude of the sun observed as 116° 11′ 10″. After ascertaining the breadth of the Katul's bed as 105 yards at this spot, I proceeded with a party in a direction of 135°, so as to trace both it and the Nahrwan to where the upper canal of the Khalis, named the Sindiyeh, crosses their line to the south eastward. The Katul touches the N. E. point of the Alibat grove, and the S. E. limits of the Nahrwan's banks is one mile distant East of it, immediately below the points where the offshoots I have before given, are derived from the Khalis canal. From the spot where the Katul touches the Sindiyeh canal, Kalaa trees bear 108°, and at the Nahrwan's points of contact with the modern irrigant, the bearings are as follows:† Jedideht-al-Amiyat village 92°, Imam Khamseh, a tomb, 110°, Kalaa trees 129°, Imam in Nahrwan 158°, Aswad trees 164½°, Alibat grove 243°, Kom-al-Sindiyeh, an ancient mound, (distant about a mile) at the junction of the Sindiyeh with the Khalis, 42°. The whole of the modern irrigants before named are here parallel to, and only separated from each other by a narrow strip of land sufficient to prevent the unity of the streams.

We now (4h. 32m.) proceeded up the bed of the Nahrwan, which is here also called El-Tyh. It is much flooded, from the Sindiyeh canal having burst its banks in the last few days, and numerous wild-fowl finding it a snug retreat have resorted to the spot. A ride of 22 minutes brought us to a high mound on the left bank of the ancient conduit, where the road from Baghdad divides, that to the left leading to Samarrah, while Delhi Abbas is reached by the right. Here a good view of the surrounding country is obtained. The Cliffs forming the Eastern boundary of the Valley of the Tigris are seen about two miles distant, and to these the lines of the Katul and Nahrwan are both distinctly traceable, but are lost for some miles beyond; the Tigris, in changing its bed from the neighbourhood of the Median wall to the position of the modern Sindiyeh, having swept them away. With a glass, however, we can distinguish the line of the Nahrwan's continuity on the distant cliffs near the mouth of the Atheim. These, much broken by winter torrents and the abrasion of the river, form a deep bay to the right of the line of the old course of the canal, and in the valley of the Tigris below them,

* On March 26th, 1849.

† Variation of the needle 3° 40′ West.

a long and well-cultivated alluvial Hawi* has, by the late high rise been entirely submerged. The crops, prostrated by the force of the current, and exposed again by the fall of the stream, appear to be spoilt, but we are told they will yet revive if not visited by a second inundation. From this spot as far as the eye can see to the North is an arid waste, undiversified by either tree or shrub. The barren flat yields not even a blade of grass, and the glare from its whitened surface is quite painful to the eye. Turn to the south, however, and the scene is strikingly changed. The face of nature was never more gay. Vast fields, plentifully watered, exhibit a refreshing verdure, and the sombre foliage of plentiful date-groves yields a shade that softens the landscape, which is further heightened by the progress of men and animals from place to place, or by numerous herds that are enjoying the rich pasture around. The Nahrwan, indeed, severs the desert from the cultivated plains, and like in confirmed paralysis of the human frame is the medial line that separates the living portion of the country from the dead. They are here displayed in hideous contiguity, the defunct portion preponderating over the living mass, and aptly illustrative of the state of the province.

The Theodolite set 360° to the Khan Nahrwan, gave the following angles from this spot; magnetic north answering to 224° of its arc :—

Jedideh-al-Aghawat village...	357°	22′
Jezan-al-Faili, extremity of the trees of...	345	23
	343	30
North extremity of Alibat grove...	301	25
Nahr-al-Aswad village...	295	00
The line of the Nahrwan in one with Kalaa	273	30
Kom-al-Sindiyeh, an ancient mound..	253	27
Nai, high part of, an old Parthian fortress	110	40
Direction of the Nahrwan onwards.....	92	30
Sindiyeh village...	44	00
Jezan-al-Ajem	36	00

We now returned to our station in the bed of the Katul, making the distance between the ancient works as one geographical mile.

March 27th.—Leaving the Khan Nahrwan at sunrise, and keeping the course of the Katul, in 17 minutes arrived at a high "tappeh"† on its right bank, about a mile S. E. of the spot where it is broken by the Tigris.

*Hawi, the name given here to the shifting alluvial deposits that project from the high cliffs in the valley of the Tigris : the whole are generally well cultivated from Sindiyeh to Tekrit.

† Turkish : signifies an artificial mound or tumulus.

Here I again put up the Theodolite, set 360° on the high part of the Khan, having in a line with it the North point of Alibat grove; the following places subtended respectively:

Khanabat centre	350°	00′
Kalaa trees	347	00
Kom-al-Sindiyeh	327	00
Nai, high part of	212	5
High part of Nahrwan in the distance	183	30
Sindiyeh and Jezani villages in one	125	00
Extremes of Saadiyeh grove	96	00
	87	00
Jedideh-al-Aghawat in one with an ancient canal, a lateral branch of the Katul coming from this spot	68	30
Extremes of Mansuriyeh grove on the Tigris	84	10
	78	15
Station on Nahrwan (yesterday.)	308	15
Magnetic North	135	00

The Sindiyeh and Northern Jezani canals now flow parallel to each other from Alibal to this. Here they slightly diverge towards their respective villages, and while the angles were being observed three immense wild boars started, surprised by the party, from the brushwood on their banks. My companion, having brought his horse with him from Baghdad, was twice, spear in hand, close upon the heels of the largest, but, cut up as the ground was with the deep canals, reaching to the saddle, the pigs had the advantage, and were wise enough to keep to the water instead of venturing in the open ground. After an hour's fatiguing trial we despaired of driving them from their secure position, and accordingly pursued our course for Sindiyeh by Jezani along their respective water-courses. The latter was passed in a quarter of an hour from our station on the Katul, and Sindiyeh was reached in a similar time from Jezan. Here the vessel had arrived a few hours before us, and after fixing the position of the village again by chronometers and a latitude at noon, we resumed our route for Nai. Traversing the country by the same path we had came in the morning, we crossed both the Katul and Nahrwan, and emerged at once into the desert country beyond. The ruins of an ancient Town were observed between the old conduits, where a branch connected them of the same width as the canals themselves, and from the appearance of its bed I am inclined to consider it the effect of a disruption of the bank of the Nahrwan, and in this case it must have swept away a part of the town in its course. No

name applies to these vestiges at present, but the town was evidently a considerable one, from theq uantity of brick, pottery, and slag of a highly vitrified order, abounding on the spot.

By 2 P. M. we had left the cultivated lands, and, under the protection of a new guide from the Beni Timim, we traversed the desert before described in a N. W. direction, but frequently altering our course to avoid the numerous fissures made by the rain on its passage to the Tigris through the marl districts bordering on the River.

At 3h. we crossed the broad but dry bed of a torrent termed the Khirr*-al-Maghthab, and when full must have yielded a large body of water to the stock in the ancient Nahrwan. At 3h. 30m. we stood upon the walls of Nai, evidently of Parthian or Sassanian construction. They are built of massive sun-dried bricks, similar to those met with in the buildings I have before enumerated of these eras. The building is quadrangular, and about 100 yards in diameter only, with its interior quite open, and could have served no other purpose than as a "keep" or place of security to an adjoining town of some extent, whose ruins are passed over on the way to Al Heymer. Beyond its great age there is nothing of interest in the ruin, but both it and the adjoining town must have derived their water from the Nahrwan. The name is certainly not Arabic, and may be traced probably to a Pehlevi or Syriac origin. At Nai the following bearings were observed :—Sindiyeh, 189°; Alibat, 158°; Tel† Heymer, 311° 30′.

The Beni Timim families are now encamped on the plain, which is dotted with thin black tents and their numerous cattle. Being near sunset, the latter are being driven to the Tigris, which is at a distance of two miles, for their daily draught of water; and a procession headed by the Sheikh, with whom we had an interview the day before yesterday, welcomes our party to the camp. We are, however, forced to decline the intended hospitality, being pressed for time, but we are compelled to partake of some fresh buttermilk they have brought in wooden bowls; and an Arab cheese, not very inviting in its present form, must be swallowed in compliment to the donors.

Having completed our observations at Nai, we continued across the plain in a direction of Tel Heymer, (see bearing from Nai) passing over

* "Khirr" is a name in use in this part of the country for natural fissures formed by small streams or winter torrents, and differs from that of Nahr only inasmuch as the latter is adopted generally in reference to excavated works.

† An isolated mound is called in Arabic "Tel," and is similar in meaning to the Turkish "Tappeh."

the site of the town I have mentioned as adjoining the ruin. The mounds covering its edifices denote its circular form, but nothing beyond could be ascertained. The usual remains were thickly strewn over them. The patriarchal old Sheikh, by way of compliment, accompanied us thus far on our way, and now took a friendly leave. An hour's fast amble from Nai brought us to Tel Heymer, which appears to be the ruin of an isolated tower only, of the same era as the other ruins, with a few scattered buildings around it. The plain on which it stands is somewhat more elevated than the flat land we have passed over, and apparently of a more productive soil, for grass is sparingly seen in the hollows where rain has fallen, and the beds of the torrents that are passed between Al Heymer and a portion of the Nahrwan, still existing on the summit of the cliffs east of the Atheim, abound in natural vegetation intermingled with a variety of wild-flowers. At Al Heymer the flags displayed by the "*Nitocris*," at anchor off the mouth of the Atheim river, bore 248° 30′, and Nai 131° 45′. Leaving the ruin, the valley of the Tigris was gained in half an hour's quick amble, just as the sun went down, but we had the mortification to find a recently inundated alluvial "Hawi" of two miles in extent, prevented us from communicating with the vessel, it having been converted into a swamp too soft to bear even the weight of a man; and it was with much difficulty we could obtain drinking water, though pools of it were not a stone's throw from our position: the cattle, indeed, were compelled to go without, and one horse, in attempting to reach it, was with difficulty withdrawn from the tenacious bed he inadvertently ventured upon. The night set in bitterly cold, with a cutting N. W. breeze, and this was much felt by the party, from a scarcity of wood not enabling us to maintain the usual fires. The high cliffs close to our position, undermined as they had been by the great rise that took place a few days back, fell with a stunning noise into the Tigris at intervals through the night.

Our signal-fires had been observed from the vessel, and the next morning at daybreak she dropped down to the spot, but before we could communicate with the people on board, we had to undergo a perilous scramble over the tottering but still erect portions of the cliffs, that are now surmounted by the much broken bed of the gigantic Nahrwan. On attaining the bed of the canal where it is broken by the river, it was a curious and interesting sight to witness under the very spot

that centuries ago the ancient stream had flowed over, the mast-heads of a British steam-vessel, decorated as they were with the ensign of the nation, and some other flags that had been hoisted as signals for the surveying party, while a glance over the verge of the cliff itself exposed the hull and the white decks to our view, reposing like a swan upon the still waters of the upper Tigris. While sighing at the wreck of the past, it was not the less gratifying to behold the descendants of a nation then unknown to history, pacing to and fro, with a proud confidence in their own power, on a complex fabric of recent invention that they can claim as the offspring of national genius perfected by native science, which, with steam as a motive power, enables them, indeed, to penetrate, in comparative security, the interior of foreign and but half civilized states, and viewed in a geographical light alone has contributed materially to aid in the progress of discovery and research.

After fixing the position by chronometrical observations, and the following corroborative bearings, tomb and trees of Syed Mahomed 264°, direction of the Nahrwan onwards 302° 30′, Khan Dholoiyeh 298° 45′, Sindiyeh 148° 30′, Nai 106° 45, Al Heymer 62° 40′, and ascertaining by admeasurement the breadth of the canal's bed as 128 yards, we proceeded on our route, but were compelled to make a detour to the north before passing the Atheim river, to avoid the numerous "Khirrs" or winter-torrents that cut up the country within two miles of the valley of the river. The depth and extent of some of these ravines indicate that the Nahrwan, in its flourishing period, was considerably augmented by the torrents that in the winter now tumble uselessly into the Tigris. Their beds are at present dry from a scarcity of rain during the last two months, but all exhibit a highly verdant crop, bespangled with flowers of every colour and hue, among which we could recognise the dandelion, the crocus, the common daisy, and the little Scottish "gowan." The rish scarlet headed-poppy, too, sometimes in thick beds, and at others sparingly scattered among the other flowers, gave a pleasing contrast to the pretty scene. The Khirr Noorch and Khirr-al-Heymer are the largest of these ravines.

By 10h. 30m. we had reached the Atheim, which flows in a valley similar to the Tigris, and is bounded by high marl cliffs of the same nature and form. The at present petty stream occupies but a few yards of the valley, which is upwards of a mile broad in many places; but I am told that occasionally in winter months it becomes a turbulent

and fractious torrent, quite impassable when thus swollen. In the bed of the shallow stream the last traces of the tertiary formations are visible, shewing that the marls we have passed are but superimposed strata of no great depth. In these parts, as in the Tigris, alluvial "hawis" project from the perpendicular cliffs of the valley, and can be viewed only as water deposits that vary with the direction of the stream. They are mostly covered with brushwood and small tamarisk, and might be cultivated but for the uncertainty of the floods. Insignificant as the stream now is, it took us an hour to ford it, for the late rise and subsequent fall have left on its margin banks of viscous mud that the laden beasts could scarcely get through. The instruments were, however, by good management brought over dry, but not so other portions of the baggage; and while all were more or less engaged in the passage of the animals, an ignoble horse, bestrode by one of the muleteers, had contrived to spoil the expectations of our Arab guide, by an admixture of impure blood with what he termed the pure Nedji breed of his mare. It threatened to end in an open quarrel, had not the rest of the party interfered, and the insult, as it was termed, was not forgotten, but brooded over for some days. The incident, however, caused much mirth, for the fellow had been boasting of the pure stock of the animal for some time, whereas "Kadeish"* was stamped in legible characters on every part of her frame.

Having quitted the brawlers and re-arranged the baggage, after ascending the cliffs bounding the valley of the Atheim to the west, we turned to the south so as to meet the course of the ancient canal, and in half an hour again stood on its elevated banks, which overlook the flat country to a considerable distance. We are now about 1½ miles to the west of the spot, where the Atheim, resuming its natural course after the destruction of the great dyke, which I shall presently describe, severed the Nahrwan, and probably first caused its decay. Xenophon, in his retreat of the "ten thousand," remarks the passage of the Physcus, about the fourth day after crossing the Tigris at Sitaki,† and the geo-

* "Kadeish," a name applied to draft horses, and in use as a term of demerit among horse-dealers.

† Sitaki is considered on good authority to be identical with the suburb of the modern Bagdad on the west bank of the Tigris, and notwithstanding the generally received opinion imbibed from oriental authors in the history of the Khalifs, that Bagdad was founded by Juansur, the second Khalif of the Abbassin family, on an entirely new site,—or rather, as some say, on a spot destitute of anything but the garden of a solitary Christian hermit,—we must now admit its erection, from recent discoveries of cuneiform inscribed bricks in regular building, on a site once occupied by a Babylonian City.

graphical position of the modern Atheim, indicates it as the same stream, for the Nahrwan, or rather Katul, of the Sassanians, could not have been then excavated. The place where Xenophon crossed it, however, near the position of Opis, must have been at its point of junction with the old bed of the Tigris,—a distance of twenty miles south of the present confluence of the streams,—for we have evidence that the Tigris at no very distant period, materially changed its course, and, indeed, swept away the canals as we see in the present day. The old river is still traceable in a deep and well-defined bed in the position ascribed to it in Captain Lynch's excellent map, and the Arabs I have with me fully corroborate its delineation. The site of Opis, therefore, as I have advanced in a previous paper,* must be looked for on the line of the Tigris's former course, where the Atheim disembogued into it, and not in our immediate vicinity, where modern explorists, for some unaccountable reasons, have agreed in fixing its identity.

At this spot the Nahrwan is 140 yards broad, with a depth of twenty feet below the surface of the country. It still continues its straight and decided artificial character, though much broken from its angular position between the present Tigris and the Atheim. Its course onwards is 309° 30′. Khan Dholoiyeh from this spot bears 283°, Tomb of Syed Mahomed 240° 45′, direction of the canal back 122°. Continued at 12h. 45m., and in twenty minutes reached the spot where the Batt canal and the large branch emanating from the Tigris at Al Kaim joined the main stream. This is an interesting portion of the old conduit, but as I have to examine the Batt, I shall leave the description of the ruins in this locality to the last.

We accordingly quitted the canal for the vessel now at anchor a little south of the modern Khan Dholoiyeh, which is a halting-place for Caravans on the road to Samarrah, erected from the ruins of the works in the bed of the ancient stream. It is a filthy yet commodious resting-place to the weary pilgrim, but not always a secure one, for it has to be abandoned at every visit of a marauding party, and is, in general, either totally demolished or partly destroyed only, according to the temper of the tribes at the time. By sunset that evening I had arranged for a further absence, and after rating the chronometer anew, and securing a

* See also towards the conclusion of this paper.

Khanchi* as a guide, passed the night among the rich cultivation in an adjoining "Hawi," preparatory to an early start on the morrow.

March 29th.—With a long march before us we were in the saddle as day was breaking, but had some difficulty in threading our way through the swamps that have succeeded the fall of the river. By 7h. 10m. we had reached the Nahrwan, half a mile above the dam, and started for the Batt canal on a direction of 30°. At 7h. 40m. we came upon it after traversing a perfectly flat and uninteresting country, and continued our course along its bed which is here well-marked, but not ten yards wide, in a direction of 11°. Progressing over the same monotonous void, at a pace of 3½ geographical miles per hour, at 8h. 45m. some extensive mounds, now termed Dhahubeh, mark the site of a town that formerly occupied the banks of the Nahr Batt. The guide informs us that a large quantity of gold and silver was once found here, and its name, having reference to the former metal, may give credence to the story. The usual remains of brick, pottery, and scoriæ, are profusely scattered around. The Maliyiyeh at Samarrah is distinctly seen from Dhahubeh, on a line of 283¾°, and is evidence of our having ascended considerably in our two hours' progress to the North. The high mound at the ancient bridge opposite the junction of the Batt, with the Nahrwan bears 200½°. From this the Batt takes a more easterly direction as 44° of the prismatic compass, and this line is continued with but slight variation for an hour and three quarters. At 11h. we halted at a distance of two miles from the Atheim only, on the site of an ancient town now represented by several mounds on either side of the Batt. These are called at present the Tellul Nar.† Fragments of old pottery with some curious devices, among which the folded snake, as an emblem of eternity, were observed, and a dog of the same material, but coated with a green enamel, was obtained nearly perfect. Large bricks, and a profusion of highly vitrified slag, were spread in thick disorder over the surface of the extensive heaps. It has doubtless been a considerable town, and the figures of animals and reptiles pourtrayed on the broken vases, proclaim its era as prior to Islamism. The meridian altitude of the ⊙ obtained here at noon, gives the latitude of the ruins as 34° 13′ 51″ North.

* One of the proprietors of the Khan.

† تل 'Tel' signifies "a mound" or elevation, and تلول Tellul, employed here, is the plural form. Tellul Nar would signify "fire mounds," and is apparently a modern appellation. The site, however, may have been occupied by a fire-temple, and hence probably its name.

At 1h. 45m. re-mounted, still keeping on the line of the Batt in a direction between 30° and 48° alternately; at 3h. 4m. the canal is seen as divided into two channels, and the adjoining soil, exhibiting some very old furrows, would seem to mark the locality as the former site of some large groves. There are no evidences of ruins here, but half an hour further on some high mounds, covering ruins at present named Sathha, point to the locality as a well populated district. The ground is strewed with the usual relics, and a great quantity of broken glass in a vitrified state was occasionally seen sprinkled amid the detritus. Some copper coins entirely corroded were also observed, and a piece af hard pottery, apparently part of a dish, now in my possession, whose surface is enamelled with mother of pearl, is a curious and beautiful specimen of encaustic glazing in vogue at the time. Other mounds to the west of this position, and named Mismeh, were pointed out to us as marking the ruins of a town.

At 3h. 45m. continued on a course between 36° and 35°, with the intention of encamping on the Atheim river, for neither water nor pasture is obtainable for the cattle at a distance from its banks. The Batt, which from Sathha takes a more northerly course, was now left. At 4h. 42m. we skirted the broken cliffs bordering the valley of the river, and in an hour came to an encampment of Azza Arabs. Here we bivouacked on the margin of the stream, whose current may be at the present time about 1½ miles per hour. Its breadth does not exceed twenty yards, but the features and width of the valley through which it flows, bear evidence of its impetuosity and great extent at times. In ordinary wet seasons the Atheim has in this month a different aspect from its present insignificant appearance, the drought of the last two months having drained it of the greatest part of its water. In the summer, the bed is frequently dry, but the Arabs continue to encamp in the valley for the sake of the pasturage, and by excavating the soil water is at all times obtainable, as they say, delightfully cool and pure. It now forms a succession of deep pools, which abound with a large species of mullet that gives zest to the simple fare of the nomade families; a three-pronged spear is employed to take them, and in its use they are very expert.

We found our new friends the Azza very civil and communicative and had scarcely spread our carpet before they had seated themselves

in a circle around. Many of these people, I find, are acquainted with the influential Christian merchants of Baghdad, and indeed are employed by them to raise the "daym" crops, the seed being furnished them for this purpose; and in return for the harvest they obtain from their patrons a supply of dates and clothing, which though luxuries to these poor people, are not commensurate in value with the merchant's gains. On the other hand, it must be considered that they are too poor to sow to any extent themselves, and, indeed, too independent to take the trouble and risk attending it, but so long as the merchants are willing to do this, and dispatch them the means of raising a harvest, they will undertake to scatter the seed on the ground, leaving the rest to nature and the chance of a plentiful rain to aid in its growth. As they constantly reside in the vicinity of the Atheim, and experience a benefit by entering upon the merchant's views, a mutual interest is felt and perpetuated. But few families of them are west of the Atheim at the present time, for of late the differences existing between them and the Ayazza, a powerful tribe to the N. W., have rendered them cautious of venturing across the stream. A lamb, fish, buttermilk, and milk, were brought us as a present by the Chief, and yielded a sumptuous repast. These offerings are however attended with much expense, for they seldom fail to abstract double and treble their value in coin in return, but in this singular country, unless one travels as a beggar, and then enjoy the hospitality gratis, it is incumbent on the party to make an acknowledgment to the servants if not to the head man of the tribe.

At daybreak the following day we were again pursuing our journey, but it took us some time to clear the broken ground skirting the river. The day to my mortification set in cloudy, and I despaired therefore of being able to get observations of the sun. By 6h. 40m. we had gained the high ground, and in order to get a sight of the Batt kept a direction of 311°. At 7h. 2m. it was crossed, and a course was now made at a short distance from it of 11°.—At 7h. 43m., Tell Willi, on the east of the Atheim, bore 144°, and at this time the undulations called Al-Aith form distinct ridges on the plain increasing in elevation every mile that is advanced. These are of pebbles, but covered with a smooth earth, and run parallel to the direction of the Hamrin hills, and may be said to mark the south limit of the great tertiary beds in this meridian of longitude, for the tertiary rocks are at no great distance below the surface in this country, when these siliceous depositions are

exposed to view. The space between these ridges is richly clothed with grass, intermingled with wild flowers, among which the camomile and a variety of stocks were prominent. By 8h. 37m. we had reached the foot of the barren ridge known as the Hamrin, and the soft soil of the low country, that scarcely emitted sound from the horses' feet, was instantly exchanged for a loose pebbly region that clattered beneath the iron-shod hoofs of our animals, much to the astonishment of the gentle Arab that had been reared on the plains.

Riding along the elevated banks of the Batt canal, in a few minutes we arrived at its point of contact with the Atheim, which river is seen winding through a break in the hills about eighty feet below us. The Hamrin rise in this part about 300 feet above the plains, and the breadth of the valley of the Atheim is as near as possible 600 feet. The stream at the present time occupies about fifty feet of this only, but the appearance of the lime-stone rocks that confine it at thirty feet above its present level, will bear out the character given to it, of a rapid and impetuous torrent when swollen by the rains of winter. Before the Nahrwan could be in operation, it was necessary to confine this destructive water-course, and the skill and energy of the period is manifest in the work before us. The stream was, however, deemed necessary to maintain a proper supply in the greater Nahrwan, and though it was diverted from its natural channel, we find it traversing the country on a much higher level, and dispensing its benefits on the way, over an otherwise barren tract, finally entering the great conduit by the canal which we have journeyed along, at present known as the Nahr Batt, and a similar canal, the Nahr Kathan, left the east bank of the Atheim, in like manner irrigating the great plain of Garfeh on the opposite side. This last was not, I think, connected with the Nahrwan, otherwise its bed would have been seen: the natives, moreover, deny that it was conducted there, and affirm that it was lost in irrigation. The dam has evidently been at one time a strong work, composed of roughly-hewn blocks of sandstone purposely wrought with uneven edges to give a greater hold to the concrete employed in binding them together. These vary in size and shape, some being oblong, while others are square. The latter have a diameter of three feet, the former of sixteen inches only, but both are of the same depth of sixteen inches. The concrete used as mortar is very durable, and made by an intermixture of minute pebbles with lime of a very fine quality, obtain-

ed, as is the stone, in the immediate vicinity. The front of the dam exhibits a perpendicular wall to the direction of the stream, and the back, built terrace-wise from the bed of the river upwards, opposes a strength in conformity with the sustained pressure. At its base the structure attains a breadth of 36 feet, gradually lessening to 23 feet at a platform six feet below its surface. The centre, however, has been either swept away from a neglected repair, or destroyed by an enemy. The latter is the most probable, for the Nahrwan was the defensive bulwark of the capitals occupying the isolated tract between its stream and the Tigris, and the letting loose of the waters of the Atheim into their original course would effectually remove the more formidable barrier, by undermining the artificial conduit, and involving the surrounding country, with its towns, villages, and fields, in one common ruin. Near the summit of the portion occupying the east side of the valley, are the remains of sluices for admitting as much of the water into the dried-up bed as was necessary for cultivation. These could only have been used when the Atheim was at a great height, for their floors are at least 33 feet above the present level of the river. The abraded state of the concrete spread over them for protecting the surfaces of the floors, and the undermined condition of the substantial buttresses of brick between the sluices, shew that they were long in operation, and establish the fact of the success attendant on the erection of the structure, even did not the ruins of substantial towns on the Batt canal attest its great utility also. The top of the dam is at present 40 feet above the level of the water, and the lofty situation of the sluices conveys at once an idea of the body of fluid sustained by the magnificent work before us, for when full, the whole body, dammed up as it was, must have presented a sheet of water 200 yards in breadth, with a depth of six and seven fathoms in many places. The sluices were each seven feet four inches wide, but the dimensions will be better understood from the accompanying plan. The buttresses, constructed in an oval form, are massive and compact, and exhibit a very neat order of brick-work.*

* My lamented friend Dr Ross, in his notice of a visit to this spot, described in the Journal of the Royal Geographical Society, Vol. XI. Part 2nd, page 132, gives Suliman Pasha the credit of erecting these buttresses when making a futile attempt to restore the dam. A closer scrutiny would have shewn him that these fabrics were the identical ones in use when the sluices were in full operation, and one may be seen partially embedded in the more solid materials of the old work. Suliman Pasha, I believe, repaired some parts of their facings, and the Arabs, everywhere alive to found great stories upon small events, have a ready tale to satisfy every querist.

Where seen in section separated by the river, the Hamrin hills exhibit beds of stratified limestone and sandstone, with a superimposed stratum of conglomerate of varying depth; the whole evidently supracretaceous, and apparently uphove in some convulsion of nature. The strata on the East side of the valley incline to the south-eastward, with a dip of 65°, while those on the opposite side are nearly vertical, inclining to West.

We have nothing to guide us as a clue to the history of the structure, nor does, I believe, a single work extant of the old writers even allude to it, or to the stream itself, if we except Xenophon—who places his Pyscus in this locality, and which is generally pronounced from the itinerary of his famous retreat as identical with the Atheim. The destruction of the work, though great evils must have followed it, is also left unrecorded. Its origin is doubtless due to the Sassanians. Tradition assigns it as a work of the Amleki or Amalekites, but these favorite masons of the Arabs are generally supplied to fill up a tale when history is vague, and imagination speculative. Some caves in the cliffs at a short distance from the dam, were pointed out as the residences of this early building community, but as I regarded them as excavations made for the lime and material, I declined going to see them, as I had plenty of occupation during the few hours of our stay. The river was not fordable, and to obtain the measurements on the other side, it was necessary to swim it, which was accordingly done, though a bitterly cold day in March. A shirt, a pair of riding boots, and a measuring tape, were conveyed dry on the head across the stream, and in this garb only we completed the operations, much to the astonishment of a party of the Azza Arabs that had heard of our arrival, and, of course, soon collected on the opposite bank of the River. The sight of Englishmen is at any time strange to these wild people, but to see us in our present guise both surprised and amused them. We were at once pronounced as madmen as we skipped in spurs and shirt among the ruins, and the benediction for this class of people was solemnly uttered by the elders of the tribe. The younger and more sagacious, however, thought we had a method in our madness, and we were asked confidentially when the restoration of the structure was likely to be completed, for they foresaw, as they said, the occupation of the country by the Frangis, adding, that it was ours before and would be so again,—alluding to the conquests of Alexander and the wars of the Romans, of

which they have some traditions, but all are more or less distorted and vague. Some of our new friends gave us excellent advice relative to the proper season for building the foundations, and when they saw me observing the sun for the latitude, it was settled that I was consulting the horoscope for a favorable time to commence. These people were not so civil as those we met with on the preceding night, and moreover, they took the opportunity, when we were absent on the opposite side of the stream, of plundering some small articles that had been negligently placed in their way. Their departure was singularly abrupt I thought, and at the time unaccountable, but the abstraction of our property I found afterwards was the signal to decamp. The observations made place the interesting work in latitude 34° 32′ 50″ N., and 17′ 7″ East of Baghdad, chronometrically determined.

With but little time at my disposal, and fortunate in obtaining a sight of the sun after the cloudy aspect of the morning, it was not worth while delaying longer in the neighbourhood, though there are doubtless some objects of a secondary interest in the quarries, and in the Nahr Kathan. We therefore left, after filling the skins, in order to break a long stage of 13 hours, destitute of water. Lying between the Bundi Atheim and the Tigris, a course of west was kept over, and along the ridges termed Aith, that I have mentioned before, for six geographical miles. The ground passed over was very beautiful, and literally strewed with flowers, in full blossom, of great variety and color. The soil in the high grounds is evidently more productive, for the constrast between it and the lower lands passed on our journey of yesterday was very great, the latter being, in the absence of water, a barren, friable marl, while here we have a rich green sward bespangled, as I have mentioned, with the wild geranium, a great variety of the common stock, anemone, the wild camomile and the crocus, besides other plants whose names I am ignorant of. Arab esculents, too, are not wanting, among which are the truffle, and a pod in taste exactly the same as that of the English pea, but not above an inch in length, with a downy epidermis and a longitudinal indentation on either side like that observed in the stone of the date. Its resemblance to the scrotal appendage of a young kid has given it among the Arabs the name of the Khasu-al-Jiddi.* The plains, however, abound with antelope and "hubara,"† and some scattered quills shew that the porcupines' habitat is in the locality also. Two snakes were

* Testes agni. † A species of bustard.

seen among the ruins, and one that we killed proved to be of a harmless and common species.

Having attained the distance of six miles from the hills, our guide kept us a course of N. W., very wide from the proper direction; and as he had been procured from the Azza Arabs who had visited us in the morning, we were suspicious of his intentions, particularly as we could distinguish some smoke not far from the track we were inclining to, and moreover, the region was notorious for harboring depredators both from the Azza and the Al'bu Ayatha tribes. Sandhills now began to shew themselves, and the guide affirmed we could not go straight from the loose nature of the soil at every step, and having heard of this local peculiarity before we proceeded onwards. Though we had not seen the tents of the tribe whose smoke was discernible, the lynx-eyed inmates has descried our party at a distance of at least three miles. From the increasing dust we imagined they were in pursuit, and the spyglass shewed a large body of mounted Arabs careering in every direction to give their horses a good wind before pouncing upon us. We called a halt on the summit of a mound, quite prepared for being stripped, or otherwise, according to the temper of the party in pursuit, for our small force was not in a situation to oppose the numbers that were advancing, and a general run would have been as vain as undignified. As usual with them, a single horseman preceded the body at a full gallop some way in advance as a videt, and if necessary to parley in the event of the enemy shewing a determined front, in which case to avoid bloodshed a compromise takes place, and by the payment of a sum of money the caravan passes unmolested. If, however, the odds are great on the side of the Arabs, they fall at once on their prey, and an indiscriminate plunder strips the wayfarer of everything. The state of the odds is generally known long before the collision, for though useless, the weaker party takes to rapid flight, and perhaps, in this instance, the unusual posture we assumed of standing alongside our miserable horses, guns in hand, had some effect in deterring our pursuers. The scout was met at a short distance from our position by another detached from our party: as they met, the points of the projected spears were thrown in the air, and standing at a wary distance from each other, for in the desert the rule is that every one is an enemy until he is proved to be a friend, sundry questions were asked and answered, and the scouts returned with the same speed to their respective parties. They proved to be a portion of

the Ayatha, under Sahdun's son, and at enmity with the government. We had been taken for a caravan of pilgrims direct from Persia, en route to the Shrines of the Imams at Samarrah. When informed, however, that we were English come to spend a few days of the spring season on the desert, the hostile attitude was exchanged for one of invite and welcome to their tents. We pleaded the long journey before us before we reached the Tigris in excuse, and resumed our way while they went slowly back to their encampment. It was, at all events, consolatory to reflect that we were neither Persian pilgrims nor a trafficking community, for had we been, that night would have been spent in a state of nudity; and how many would have reached the Tigris, travelling barefooted, naked, and without water, through the deep sand we afterwards traversed, is a matter of speculation.

We found our guide right in his description of the difficulties attending the direct journey between the Bandi Atheim, and the village of Dur on the Tigris, for we had now reached the margin of a sunken district called Toos,* in which are many sand hills that are said to shift about and alter their shape with every fresh wind that blows. The highest of these singular drift-hills is named Moktaa-al-Ras,† and I presume is thus called from its being the most northerly. Wells are sunk in many parts of this inhospitable tract, and water, I am told, is always found on reaching the soil beneath. These wells, however, constantly require to be dug afresh, as they fill up if deserted for a short time even. At sunset we had reached a dry valley termed the Wadi Awad, that comes from the Hamrin hills, and bears evidence of being a considerable stream in winter. It would appear, from its direction, to be the principal source of the supply of water to the sunken track during the rains, which, percolating the drift sand on the surface, lodges on a hard subsoil, perhaps of argillaceous marl. Evaporation is thus prevented, for the heat cannot pierce to any depth in the sandy tract, and a cool draught is thus furnished to the Arab on a spot where the mind cannot believe in its existence. In the torrid heats of summer, even, I am informed that tents are frequently pitched here, and the many pyramidal mounds serve admirably as look-out places, from whence, unobserved themselves, the Arabs can issue on their plundering excursions.

* A Turkish word, signifying very "fine dust." † "Covering the head."

The Wadi Awad is rich in grass and pasturage. Its general direction is 15°, and opposite 230°. Here, however, in a place so well adapted for it, no "daym" is seen, and its absence marks the abode of the thoroughp redatory races, who neithers ow nor reap excepting, as regards the latter, it be the property of their more civilized brethren. After a drizzling night, we proceeded on between similar heaped-up mounds of sand on a course of 278°, and in an hour Moktaa-al-Ras bore 335°, at a distance of a mile or so. The direction of our march was now changed to 265°, 250° and 245°, alternately, in the next two hours and a half, and subsequently for half an hour to 265°. At this time (9h. 6m.) the sandy tract had been passed, and the sterile pebbly stratum of the surface of the lower plains was entered upon,—after crossing two saltwater streams (at 9h. 40m.) named Sahreh, and Nahr Milka, that, coming from the W. N. W., find their way into a marsh, a little to the S. E. of this. Much salt is collected there by the inhabitants of Dur, who transfer it to Baghdad by the river. From these streams to the Tigris is over a barren heath contrasting greatly with the pretty sward passed over yesterday. Nothing whatever breaks the view. Destitute of water, the Arab merely crosses it on his search for plunder, but makes no permanent stay, and until the banks of the Tigris are in sight, the eye in vain wanders for a resting place. Two and and a quarter hours' distant from the salt streams, on a course varying from 235° to 225°, brought us to a new discovery, for an ancient canal was crossed that we did not know the existence of before. They apply the term Hadideh to it at present, but I suspect it to be the continuation of the Nahr Hafu, that has its origin immediately below where the Tigris breaks through the Hamrin hills. Its course is quite straight, well marked, and about thirty feet broad, on a line of 322° and 142° of the prismatic compass.* Dur minaret can be seen from it on a bearing of 278°, where we crossed it. We now kept a course of 247°, and in twenty minutes passed over the road leading from Dur to the salt lake described above, in a direct line of 93°. Dur minaret at this time bore 282°. In an hour and forty minutes more, the high mound at the ancient stone-bridge called Kantaret-al-Resaseh, near the head of the ancient conduit, was reached, and in a few minutes more, traversing its gorge-like bed, the broad stream of the Tigris was gained,

* I presume it was connected with the Nahrwan by the lateral branches seen on the north side of that great work. See Map.

and to none was it ever more welcome. Both men and animals made a simultaneous rush to quench the thirst that had latterly become urgent,—the horses indeed had been 28 hours without water, and for the last nine hours had been urged along at a rapid pace with the additional disadvantage of a hot and S. E. wind that had set in since the dawn.

Rain had not fallen for two months, and by the time we had pitched the tent in the bed of the old Nahrwan, it came down in torrents, and lasted throughout the succeeding day (April 1st.) We were consequently compelled to remain motionless, and our party, now thoroughly saturated, and badly off for provisions, were exposed also to the cutting breezes that blew fiercely down the excavated defile. A partial clearance, however, at noon enabled to send to Dur for provisions for man and horse, but on their return, the country from the dry and arid tract described yesterday, had become a swamp, and horse and men fell with the load on their return unable to join us without assistance. This was despatched, and we had the satisfaction at sunset of sacrificing a sheep, at what may be considered the "ultuma thule" of our researches, for the entertainment of our shivering followers. They are of course hungry enough, and in high glee at the prospect in store for them: all are fully occupied in the process of flaying and dressing the victim, and ever and anon a prayer is breathed for its tenderness. The hour for the wished-for meal has arrived, the " bismillah" has been said—I fear without a thought of its holy meaning, and the noise of anticipated pleasure has given place to the silence usually indulged in by orientals at their meals. Every finger is deeply embedded in the kabob'd sheep, and as satiety is arrived at, the Ya !—Rabi !* of satisfaction and fulness is followed by the Al hamd'Allah of thankfulness and content.

Hands are either washed in the stream or are wiped on the beard at the pleasure of the owner, and the party again seat themselves around the night-fires, for it is dusk, while the *"night-cap"* of the Arab, the refreshing coffee, is being prepared by the good-humoured Syed. It is duly swallowed, and the last embers of the pipe are turned out, when one by one, with the exception of the watch, they stretch themselves out for repose, though the night-owl and the jackal threaten to invade their slumbers. The clouds have now broken, and the moon in all her splen-

* يا ربي A pious ejaculation, signifying "oh my God!" but in frequent use in unmeaning phrases among listless and well-fed orientals.

dour lights up the desert scene fully as bright as she did in the days of the land's prosperity and greatness. The difference is, however, great; and as we stand on the margin of the cliff formed between the rapid Tigris, which still flows as it did of yore, and the angle of the excavated work of the Sassanians, we trace the lights and shades on many a building of antiquity, which, though crumbling to ruin, have for many generations stood erect, as if in mockery of the hands that reared them. Embraced between the classic river, and the extended arms of the royal canal, a tract of land of 30 miles in extent is thickly strewed with the monuments of the past, and now, with the exception of the modern Samarrah, a paltry village, it boasts not of a habitable abode. The Malwiyeh, Tel Aly-Ashik, the Khalifa, and the Tower at Al-Kaim,* all excite a deep interest,—not so much on account of their antiquity, for with the exception of the second and last, none are of an earlier date than the era of Abbassin Khalifs, as for the great contrast they display with the present condition of the land, and the impoverished state of its population. Did we not see the mansions and towns, the canals and bridges, before us, we cannot appreciate or credit even its past condition; nor could we conceive by comparative analogy, the numbers of the human race that gave animation to the deep silence that now reigns over the deserted cities. The silence is indeed painful, and occasionally broken as it is by the howling of the jackal, a relief is felt in keeping with the scene. There is music, harsh as it may appear, in the jackal's noise—at least so it seems to me, especially in this land, endeared to all by historical associations as the theatre of the great deeds of old. The deep bass of the matured, and the alto and soprano of the growing and the suckling, as they issue in full cadence from the tombs and deserted vaults of its kings—sing alike a wail for the mighty dead. I love, too, another denizen of these wastes and desolate cities,—the sapient owl, and its very name of Boomeh-'t-al-Kharaib, "owl of the ruin," of the Arabs, has in it a poetry for me; for when peering into its large and lustrous eyes, devoid of either animation or expression, it is like searching into the deep blue of the skies, for they speak of a deepness of wisdom beyond my comprehension; and as it sits absorbed as it were on yonder fragment of a wall, I imagine that the creature possesses a

* A more detailed description of the places will be found in Dr Ross's journal, printed by the Royal Geographical Society, Vol. XI. part 2nd; and in a former paper of my own in the Bengal Asiatic Society's Journal for April 1847. I hope, if time is allowed me, to have a further opportunity of making a detailed plan of this locality.

clue to its past history, which, like a closed record in a cabalistic tongue, I can neither read nor unseal.

The observations obtained the succeeding day for the chronometer, and for latitude, place the head of the royal canal in latitude 35° 24′ 40″, and 39′ 34″ West of Baghdad. The variation of the needle was ascertained also as 3° 40′ westerly.

Shortly after noon we quitted the head of the canal, and proceeded to the high mound on the left bank close to the ancient stone bridge now known as the Kantaret-al-Resasah, but which is identical with the site of Kasri Mutawakil or Jaferi of the quoted MS. in the preliminary remarks.* It was the only stone bridge in its whole course, and the granite its foundations were built of, is still being excavated from the bed of the canal. Its present name is derivable from the "lead" used to clamp the stones together. Here the following angles were observed by the Theodolite set 360° to the Malwiyeh :—

Tomb of Imam Hussan Askeri	2°	17′
Abu Delif or Hatem spire, 1½ miles distance	9	20
Ashik, ruin of palace on west of Tigris.	16	20
Mehjsi mounds opposite the head of the canal	137	50
Head of the canal, latitude and chronometer stations	155	40
Imam Mahomed Dur tomb at Dur	194	29
Minaret of Dur village	196	44
Tel Benat, an ancient tumulus	209	58
Direction of the Nahrwan southward	338	32
Tel Alij, an ancient tumulus	351	53
Magnetic North, on its arc	163	00

To transcribe the journal of operations from Kantaret-al-Resaseh would be tedious and uninteresting, especially as the general description of the canal is contained in the geological features of the district touched upon in the preliminary remarks. The map will convey an idea of its windings and lateral adjuncts as far as I traced them, and it remains, therefore, only to state that the principal objects enumerated both in the map and in the journal from the head of the Nahrwan to where I left it, on March 29th, in pursuit of the line of the Batt canal, were determined by trigonometrical data, from a base measured on my return to Khan Dholoiyeh. As we ride, however, along the elevated embankments of the margin of the canal, towards the Khan, we are astonished at the wilderness of ruins before us, but our hasty pro-

* Page 234.

gress, pressed for time as we are, will not allow more than a passing glance at the present moment. These, indeed, must be subsequently examined in a detailed survey to give the interest the locality is entitled to, but I think it right to place on record the observations and angles that were taken, so as to present their loss to the geographical public, which is too often the case when documents of this nature remain in the hands of individual parties. To obtain these, the Malwiyeh was visited as well as the old palace of the Khalifs, now termed the Khalifa, whose latitude I ascertained as 34° 13′ 37″N.; and Tel Alij, a fine old tumulus, of greater antiquity I think than any monument in the vicinity, yielded from its summits the following angular valves, the Theodolite being set 360° to the Malwiyeh :—

Imam Askeri, tomb of the Imam in Samarrah	3°	15′
Khalifa or Khalif Matasem's palace, high part	38	45
Ashik palace, on west of the Tigris, N. W. and S. E. angle	69	18
Abu Delif or Hatem spire	128	22
Station on high mound at Kantaret-al-Resaseh	132	7
Tel Benat, a similar tumulus to this near Dur	141	20
Al-Kaim Tower	335	45
Angle of elevation of the Malwiyeh	00	35
Angle of depression of ditto	00	9
Magnetic Needle on its arc	200	30

From the Malwiyeh, the angles were as follows, the theodolite being set 300° to the small turret over the doorway of the Khan Dholoiyeh, which was plainly discernible, though at a distance of twenty miles, and the clear atmosphere of this afternoon admitted of the flags displayed by the *Nitocris*, at twenty-one geographical miles distance, being plainly distinguished :—

Khan Mizrakji doorway	12°	24′
Al-Kaim Tower	45	35
Tomb of Imam Hassan Askari in Samarrah	95	16
Ditto ditto ditto depression	00	54
Ashik palace N. W. and S. E. corners	180	31
Khalifa or palace of Matasem	221	39
Tomb of Imam Dur at Dur	223	27
Kantaret-al-Resaseh	219	51
Tel Benat	226	23
Abu Delif or Hatem spire	218	10
Tel Alij	259	36
⊙ Altitude lower limb for Azimuth	22	27
⊙ Near limb ditto ditto	141	38

Magnetic Needle by its arc	122°	30′
Flags of the *Nitocris* near Dholoiyeh	3	38
Tomb and trees of Syed Mahomed	9	57

By noon, on April 4th, we had completed the survey of the royal conduit, and again reached the point of junction of the two great branches, as well as that of the Batt canal, the position accorded by modern geographers to the site of the ancient Opis. For reasons, however, that have been fully given when considering the point of confluence of the Atheim river with the *former* course of the Tigris,* we must no longer perpetuate this error, though at the same time we are not able to identify the ruins satisfactorily with any other position, unless they represent those of Itakhiyeh mentioned in the catalogue of towns quoted in the preliminary remarks.† In that case, the bridge whose piers still remain in the bed of the canal at the point where the Batt joined it, will be the "Kantaret-al-Kesrawiyeh," or the "Exsars bridge" of the Arabic MSS. The ruins are certainly extensive, and spread over the banks of the three centreing streams; and, indeed, in the angle formed between the superior branch and the one coming from Al-Kaim, they occupy the entire space, and a deep winding bed shews that a portion of the water was led through the centre of this part of the town. Both arms of the canal had massive dams built across them, about a quarter of a mile above the spot where they unite,—the one in the Al-Kaim arm having been destroyed for building the modern Khan Dholoiyeh contiguous to it, but the other still remains a massive and compact structure, built of the largest kiln-dried bricks that I have ever seen in use in the old buildings of this country. They are square, of a diameter of 16 inches, and 4½ inches thick; the length of this dam is at present 90 feet, with a breadth of 22 feet, sloping from North to South at an angle of 15 degrees, in the direction of the current as it then ran. Its height is three feet six inches only above the present bed of the river, and on its surface is seen the usual concrete to prevent abrasion of the material by the action of the current. This concrete is 16 inches thick, and of a very superior make. The dams would appear to have been erected here to break the force of the stream, and thus protect the bridge which spanned the canal about three-quarters of a mile below. The remnants of the piers shew that this

* Pages 320-21. † Page 234.

was an equally solid structure and a high tumulus; named Yel Mahassil, similar in all respects to that at the Kantaret-al-Resasch, rears itself high above the west bank of the canal, and was, perhaps, intended as a landmark to guide caravans to the place of crossing,—or, as its present name implies, it may cover the ruins of some elevated building that was in use as a custom or toll-house. Opposite to this, and immediately below the position of the bridge, is seen the mouth of the Batt canal, and this stream appears also to have had a strong bridge thrown over it, from the remnants of arches that are traceable in the mounds that form its present banks, and which cover the most part of the adjoining ruins. Large masses of brickwork, vitrified by the agency of a strong heat, forming a compact mass, have been employed in the construction of the abutments of the bridge and in other buildings. On the whole, the locality is one of interest, and the town, by whatever name it was anciently known, must have ranked as the principal one in this part of the Nahrwan or Katul-al-Kesrawi. There is nothing, however, to warrant its being considered as the ancient Opis, even did the site correspond with its geographical position, for the aspect of that venerable city, if its mounds are still in existence, must be widely different from the comparatively recent character of the ruined tenements before us. These exhibit only heaps upon heaps of loose bricks, intermingled with glass, corroded copper coins, and the usual pottery observable on other Sassanian sites,—while Opis, if its vestiges remain at all, I should think would be found buried under some of the immense mounds of earth that are occasionally seen, and undoubtedly mark the more antiquated settlements.

Singular enough, the present ruins have no modern fixed appellation: at times they are called "Al Sidd," from the dam, and at others "Al-Kabbur," from the natives mistaking the ancient piers in the bed of the canal for the "tombs" of the race that dwelt here. I have dispaired from the same causes of being able to restore the lost nomenclature of any of the towns on the whole line of the great work, for with the exception of Bakuba and Aberta, intermediate history and local tradition have failed in perpetuating it. The Arabs, indeed, as if born to render destruction the more complete, have a peculiar desire to institute new and frivolous names, founded on accidental circumstances, or, at times,

even on individual caprice. This whim extends to men as well as places, and the old appellations are thus succeeded by new, with every generation. Individuals, indeed, are scarcely known by their patronymics, but are called by a nic-name, founded on a peculiarity of dress, or trade, or by some personal defect or deformity.—Europeans are subject to the same code. The wearer of a hat is immediately denominated "Abu Jidr," "the father of the pot," from its resemblance to that utensil. Should an unfortunate wight think the "horse-collared appendage," termed a swallow-tailed coat, best adapted to his person, the term "Abu Deyl," "the father of the tail," becomes his future cognomen, though the ridiculed article be discarded from the moment it attracted attention. The peculiarity is well instanced in the case of the late Sir Harford Jones, for when he was the British Resident in this country he was known only among the Arabs as Abu Jilud, "father of the skins," from his constantly wearing on his nether man the present costume of the hunting-field and race-course. The foaling of a favorite mare, the birth of a first-born, or the death of an old hag of the tribe, on any remarkable mound, is sufficient cause, indeed, for the obliteration of the old name by the adoption of a new one commemorative of the event; and as at Kabr Harbi, "the grave of Hurbi," the burial of a wretched camel-driver on the spot, but twenty years ago, has destroyed the ancient title of a fine old canal, for at the present time it is known by no other appellation. A first-born styled Kassim, will, in the same way, convert the paternal name, whatever it may be, into Abu Kassim, "the father of Kassim," which becomes the subsequent title of the parent, and vice versa. According to the caprice of the party addressing him, the same Kassim will lose his personal identity in the eyes of a stranger by being hailed as Ibu Abdullah, "the son of Abdullah," although in the stranger's presence he had been addressed by other bystanders, a few minutes before by his proper soubriquet of Kassim. It is this peculiarity I consider that has rendered comparative geography so difficult in this part of the east, making the overthrow indeed complete, and aptly verifying the words of the Psalmist,* "O thou enemy, destructions are come to a perpetual end: even as the cities which thou hast destroyed; their memorial is perished with them."

The journal here closes, after having attained an interminable length, which I had not intended at its commencement. Geographical detail

* Psalm ix. 6.

of a desert tract, is, at all times, however, a dry subject, and without some incidents of travel, or attempt at describing the manners and habits of the people one is associated with, is of very little interest to others not engaged in the great work of discovery. This attempt to relieve its general tediousness must be my apology, and I now quit the subject for the present, fondly hoping that in the revolution of time on its orbit, a new dawn may soon break over the darkened land. Of its early progress we have but glimpses, but they are radiant with historical beauty; while its meridian career, though mellowed and shaded by circumstances and events, was not less prosperous and bright. The prospect, however, soon became eclipsed, and its glory set in darkness and obscurity. The pall of night still hangs over the classic territory, but recent events that have occurred in the Pachalic and caused the removal of the former Pasha, bid fair however to regenerate the land if the contemplated improvements be carried into execution.

Turkish projects and Turkish energy go not, however, hand in hand. The re-opening of the Nahrwan is under consideration, and feasible enough to a government whose financial affairs are less embarrassed than the Turkish, but with an empty treasury, an impoverished population, a dissatisfied soldiery, and rebellious tribes in every direction around, I cannot see how such a desirable measure is to be put into operation. Security of property, the stimulus to agriculture and commerce, is deplorably absent, and scarcity of food, with its concomitant evils—squalor and disease—are diminishing the already scanty race, which, in comparison with the extent of territory, is a hundred-fold deficient. Confidence in protection, and an increased plenteousness, will alone promote a healthy re-action, and enlarge its population, to which end the energies of a new ruler should be entirely devoted, else no great public work—such as is under consideration—can be attempted. The great bane to the public weal, I mean the Arab, should be driven to his deserts, or thoroughly subjugated, as a first step. This would require severe measures, and a determined firmness of purpose, before it could be completely effected, and under the moral and physical constitution of modern Turkey, must be despaired of for the present. The condition of the province might, however, be ameliorated by tangible improvements, such as the introduction of small irrigating steam-engines to supersede the "*rope-yarn-over-a-nail*" system at present in vogue, which is so inefficient and expensive. Even one of these machines erected on

the banks of the Tigris, would display its advantages to the minds of the natives of the country, by its practical and not apparent utility. Like all small capitalists, however, they are fearful of entering into vague and prospective speculations, and considering they are ignorant of these useful engines, we can scarcely blame the caution they exhibit. Let the advantages be once witnessed, and thus made real to their senses, and the example, I am certain, would be speedily followed, and the waters of the Tigris and Diyaleh, instead of flowing uselessly into the sea, would be in time again dispersed over the rich but thirsty soil, which wants but the element to make a return, as of yore, of two hundred and fifty-fold to the agriculturist.* The day is not far distant, indeed, in which I expect to see European capitalists and emigrants turning their attention to these rich plains so as to fertilize them by the aid of machinery. By the purchase of an estate in the secure district contiguous to the capital, and the outlay of a moderate sum, success would be sure; particularly if the principal devoted his time to an active superintendence. The breed of cattle, too, might be improved, and in addition to grain of every variety,—indigo, sugar, hemp, and opium, are capable of being reared. These considerations come not strictly within the province of the geographer. In alluding to them, I have nothing but the welfare of the enterprizing at heart, coupled with a desire to witness the improvement of a country that has suffered so much neglect while possessing "per se" natural advantages of which no other country in the world, I believe, can boast.

BAGHDAD, *20th September*, 1849. (Signed) FELIX JONES, *Commander, I. N.*

To Commodore STEPHEN LUSHINGTON, R. N.,
Commander-in-Chief of the Indian Navy, Bombay.

(True Copy.)
A. MALET, *Chief Secretary.*

* Herodotus in Clio, Art. CXCIII. The fecundity of the soil is indeed proverbial, and by no means exaggerated by the "father of history," in prolific years,—and this, too, with the smallest amount of labor.

Places.	Feet above Mean Level of the Sea.	Remarks.
Aghunba	3763·0	Hill 14 miles S W of Poona.
Asseerghur	1154·0	Tree in fort, 10 miles W of Yewur in N. Konkan.
Alsunda	2177·7	Hill 2 miles N E of Khorti.
Aukai	3232·6	High peak in the Dang Country.
Ark Tree	3615·3	Tree in fort, 9 miles S W of Sinnur.
Arnalla	62·1	Station in fort in the island, 10 miles N W of Bassein.
Asseeree	1713·0	Fort 18 miles N E of Mahim.
Awnda	4338·6	Old fort 12 miles S E of Sinnur.
Awpa	3789·6	Near the village of Awpa, on the Ghauts.
Aboo, Mount	385·0	Fifty miles N E of Deesa.
Ahmednuggur	1900·0	Mean range of thermometer 77°.
Baleshwur	3827·1	Hill Pagoda, 10 miles, S of Sungumnair.
Baphloon	22 3 6	Top of hill, 12 miles W of Soolgana.
Barur	1761·4	Station on hill, 10 miles N E of Dhanoo.
Bassein Church	503·6	Top of Church at Bassein.
Beder	2350·0	Top of Beder Minaret point (Base 2250·0 feet.)
Beema Shunkar	3447·8	High Hill on the Ghauts, 15 miles W S. W of Ambagaum.
Bhatras	3635·0	Hill station 3 miles S E of Karleh, and 2 miles E of Esapoor hill fort.
Bholeshwar	2781·0	Hill Pagoda, 13 miles W N W of Soopeh.
Bhow Mullung	2649·6	Hill 10 miles N E of Panwell.
Bhowurghur	3560·9	Hill fort, 9 miles N W of Nassick.
Bori	2014·1	Hill 8 miles S W of Pangaon, on the Bheema River.
Chowrung Tree	26·7·1	Tree on Hill, 5 miles N E of Peut.
Chanderi Peak	2368·6	Peak, 8 miles N of Parbhul hill fort in the Konkan.
Ditto Highest Peak	2601·3	Ditto ditto ditto.
Dharur	2356·8	Station on the Ghauts, 6 miles N E of Toljapoor.
Dholeshwar	2949·6	Station hill Pagoda, 12 miles N E of Saswar.
Dhorub	4745·3	Hill fort, 17 miles W of Chandore.
Dighi	2489·0	Hill 7 miles N from Poona near the village of Dighi.
Dhongurgaum	2079·5	Western Extremity of the Karleh Base at Dhongurgaum.
Doorheswar	2730·1	Station on hill Pagoda, 14 miles E of Sungumnair.
Gumbeerghur	2270·8	Station on hill fort in the Northern Konkan.
Ghoutunil	2234·7	Tree on hill, 12 miles E of Dhurumpoor, N. Konkan.
Hurrichunder	4640·0	Pile of Stones on Hurrichundergurh, Hill Fort.
Hursh	3658·8	Station on ruined Hill Fort, 4 miles N. W. of Kaumbala, 3 miles W of Trimbuk.
Ikhara	4481·5	Hill fort, 10 miles N W of Chandwar.
Jeenkhor	2064·9	Ditto 2 ditto N of Chowk.
Jewra	2881·1	Station on hill, 4 miles N W of Karleh.
Kalas	2019·5	Station on small hill, 16 miles W of Indapoor.
Kuldrug	1552·6	Old small fort in N Konkan, 7 miles N E of Mahim.
Kalsubai (Highest Peak in Deccan)	5409·5	Station near Pagoda, on hill 12 miles N W of Rajoor.
Kundeshwar	4103·9	Centre of Pagoda, 15 miles W of Kheir, on Nassick road.
Kumandrug	2160·1	Station on hill, 10 miles E of Bassein.
Kapria	1531·3	Ditto 5 miles S E of Chowk.
Karunja	997·3	Highest part of the Southward hill.
Kamala	1552·1	Hill fort, 7 miles S of Panwell.
Katurwary	3003·3	Hill 16 miles S E of Vinchoor.
Kem	1962·8	Station on a small hill, 1½ miles from the town of Kem.
Kem, H. P	1956·0	On the hill, 2 miles W of the station.
Khumpeesurree	2765·3	Station on hill, 21 miles S of Ahmednuggur.
Koj	1905·8	Station on a ruined hill fort, 2 miles N W of Gorah in the Northern Konkan.
Koolung	4812·4	Station on hill fort.
Kolwa	973·1	Hill about 1 mile E of Kolwa village, and 7 miles E of Tanna.
Kankeshwur	937·6	Tree near Pagoda on hill near Poonar.
Light-house, Bombay	148·4	Top of Spire, Top of Dome 141·0.—Annual fall of rain 87 inches; mean range of thermometer 82°.
Mahaluximee	1540·0	Centre of a high conical peak called by Marrwers Valentina's Peak.

Places.	Feet above Mean Level of the sea.	Remarks.
Mahableshwur	4712·0	Station on the highest point on the rock in the Resident's compound, E of Sir Sidney Beckwith's monument —Annual fall of rain 289 inches; mean range of thermometer 66°.
Mahdow	3116·0	Hill Pagoda, 20 miles S of Baramutee.
Mandavie	4123·0	Hill 3 miles E of Tekona fort.
Mauli	2791·0	Station on a ruined hill fort in the Northern Konkan.
Mera	186·4	Station on hill, 5 miles S E of Penn. [Ghaut.
Manjiree	372·4	Station 3 miles W of Tong fort, near the edge of the
Nagphumuy	2601·2	Hill 2 miles S W of Khandalah
Nalowda	1365·5	Station on hill, 4 miles S E of Chowk
Narrayengur	2887·6	Narrayengurh Hill Pag., 4 miles E of Narrayungaum.
Neekoorda	1910·4	Station on hill, 24 miles E of Purwura fort in the Konkan.
Nimbahdera	2310·7	Station 9 miles North of Ahmednuggur.
Observatory, Bombay	64·0	Top of Pillar under the Dome.—Annual fall of rain 70 inches; mean range of thermometer 82°.
Otoor	409·8	Otoor station, 6 miles W of Trimbuck (fort.)
Pala	3486·4	Station on Peak on range of hills, 7 miles N of Karleh.
Pangole	2726·7	Hill 6 miles N E of Kundalla.
Parlehal	2320·2	Hill fort in the Konkan, 5 miles N of Chowk.
Parner	3260·5	Hill 17 miles S E of Behla.
Parnera	623·3	Station in fort, 12 miles N W of Damaun.
Pilwa	2033·5	
Purundhur	4571·0	Station in the upper fort.
Putta	4568·6	Station in old fort, 10 miles S W of Sinnur.
Poona	1850·0	Annual fall of rain 24 inches; mean range of ther 76°.
Punchgunnee	4000·0	Eleven miles East of Mahableshwur.—Annual fall of rain 48 inches; mean range of thermometer 68°.
Rajmachie	2715·8	Peak 6 miles N N E of Khandalla.
Ramsej	3292·1	Top of hill, 7 miles N W of Nassick. [Soolgaum.
Rawra	3872·0	Station on high peak on the Ghauts, 10 miles S E of
Roopgurh	1707·0	Hill fort in the Bheel jungles, 17 miles S of Songurh.
Sawargaon	1927·9	Station on a small hill, 17 miles N of Sholapoor.
Salera	5232·3	Peak on hill fort. [Karleh.
Shilatun	2·70·8	Eastern extremity of the Karla Base, 2 miles N. E of
Singi	4260·2	Station on high Peak, 15 miles of Tulligaum.
Singurh	4322·0	Station inside the fort, 15 miles S W of Poonah.
Sinnur	2812·5	Hill Pagoda, 2 miles N of Sinnur, 18 miles S of Nassick.
Soudi Peak	2·90·7	Peak 5 miles E of Purbhul, in Konkan.
St. Mary's Church, Poona	2035·0	Top of Spire.
St. Thomas's Church, Bombay	168·0	Ditto.—Annual fall of rain 87 inches; mean range of thermometer 82°.
Sulki	2363·0	Pagoda on hill, 12 miles S W of Aklooj.
Tarapur	43·5	Station on fort, on the coast, 4 miles S of Dhanoor.
Tanna Steeple	165·5	Top of Spire.
Tanna	1369·3	Station on hill, 3 miles East of Tanna.
Toorna	4619·0	Station on fort, 24 miles S W of Poonah.
Trimbuck	4254·7	Hill fort, 2 miles S of Trimbuck Town.
Tringulwarree	3241·4	Top of hill near Tulligaum, on the Thull Ghaut.
Tramlia	1000·6	Station on hill, between Trombay Mahol above Pair Peri.
Tukmuk	2616·3	Old hill fort, 7 miles S W of Gorah, in N. Konkan.
Tulloja		Hill 3 miles W of the town of Tulloja.
Umbra	3695·8	Station near village of Nowlak Umbra, N of Tullegaon.
Urun Hill Pagoda	696·9	Pagoda 2 miles to the N W of Urun.
Vinchoor	2267·1	L. Pagoda at Vinchoor town, 29 miles East of Nassick.
Wanawree	1942·0	House.
Wandow	2775·0	Hill Pagoda 22 miles S of Ahmednuggur.
Wankulgar	2847·6	Station on hill, 5 miles W of Pabul, and 9 miles N E of Chakun.
Waphgaon	2874·6	Ditto 8 miles N of Pabul.
Wujrabhai	1960·6	Hill N of Wujrabhai, in the Northern Konkan.
Wurada	4654·7	Wurada, Station on Hill, 6 miles N of Joonoor.
Wurwund	2999·6	Station on hill near the town of Karrackwahal, in Northern Konkan.

Extract from the Rangir Meridional Series Report.

Names of Places.	Lat.	Long.	Heights above Sea.	Names of Places.	Lat.	Long.	Heights above Sea.
	° ′ ″	° ′ ″	feet.		° ′ ″	° ′ ″	feet.
Ataria Station	... 28 38 5·0	79 37 42·3	677·8	Husapura S.	... 26 24 40·3	79 21 30·3	562·8
Atsu S.	... 26 35 15·0	79 23 38·4	584·2	Jagesar S.	... 29 38 59·0	79 54 36·0	7720·9
Bagwara S.	... 28 58 53·2	79 24 55·9	734·7	Janjiri S.	... 28 40 48·0	79 26 43·3	606·3
Beheri S.	... 28 51 48·2	79 38 18·6	701·6	Kulsan S.	... 26 57 7·6	79 41 7·4	573·9
Bhowaj S.	... 24 50 28·2	79 5 31·6	1438·3	Kankra S.	... 30 2 51·8	79 26 13·8	10095·4
Bironn S.	... 26 50 59·7	79 24 31·3	594·0	Kanwa S.	... 26 4 6·4	79 18 56·0	607·4
Birond S.	... 29 15 8·7	79 45 24·2	6971·2	Kasrak S.	... 28 3 48·8	79 42 12·2	632·5
Bisangarh S.	... 27 6 27·4	79 27 15·2	585·6	Mamdabad S.	... 27 18 21·0	79 28 6·9	603·3
Chandempur S.	... 27 13 30·8	79 44 29·8	551·2	Manang S.	... 25 17 27·6	79 45 35·1	1227·0
Chandla S.	... 24 36 33·3	79 29 45·0	1874·9	Mao S.	... 27 30 0·9	79 42 50·9	551·7
Dalipur S.	... 24 26 57·4	79 11 45·8	1678·1	Nagonath S.	... 25 26 53·1	79 22 39·6	1065·2
Datiari S.	... 25 6 21·5	79 24 51·9	1230·9	Nipenia S.	... 26 13 28·8	79 37 52·2	542·1
Dhaka S.	... 27 44 54·9	79 43 25·8	564·9	Para or Phara S.	... 25 44 6·3	79 42 54·6	713·0
Fatiganj S.	... 28 27 24·3	79 21 5·9	628·0	Pothari S.	... 27 23 13·3	79 27 21·4	609·3
Gajnera S.	... 28 19 57·8	79 40 58·2	651·6	Saipur S.	... 27 54 55·4	79 27 5·6	566·7
Gandaspur S.	... 26 28 26·8	79 38 21·5	542·3	Saonchalia S.	... 29 30 17·1	79 21 35·0	8526·2
Gokalphara S.	... 25 45 35·6	79 19 46·1	772·2	Seontara S.	... 26 42 23·2	79 37 59·6	572·9
Gura S.	... 25 57 39·8	79 36 10·3	547·2	Sisgarh S.	... 28 43 33·4	79 21 16·8	691·7
Guri S.	... 27 39 57·4	79 28 43·2	564·8	Thanela S.	... 24 57 53·4	79 47 29·5	1478·9

Extract from the Pilibit Terai Series Report.

Dhalelnagar S.	28 4 12·7	80 41 9·1	623·1	Ramnagar S.	... 28 16 32·6	80 41 35·7	629·3
Donao S.	... 28 44 35·8	79 48 3·2	745·0	Ramuapur S.	... 28 22 34·5	80 31 5.3	652.7
Kainkera S.	... 28 37 21·0	79 55 23·1	730·4	Somrao S.	... 28 22 44·8	80 4 19·7	691·7
Kalianpur S.	... 28 35 6·6	79 47 0·9	723·8	Shagarh S.	... 28 33 10·8	80 3 56·9	739·5
Karai S.	... 28 15 54·4	80 20 57·2	666·3	Sultanpur S.	... 28 25 3·9	80 21 11·3	690·6
Kokra S.	... 28 12 3·4	80 30 35·6	633·0	Udepur S.	... 28 28 31·9	80 13 14·4	701·9
Pipesia S.	... 28 19 37·1	80 13 7·8	677·9	Umra S.	... 28 28 35·1	79 55 11·1	708·0

Extract from the Amua Meridional Series Report.

Asu	... 26 4 35·5	80 31 14·0	523·0	Lakanpura	... 24 2 50·7	80 49 51·3	1833·1
Bakseria	... 26 50 50·5	80 31 55·6	476·4	Marfa	... 25 7 1·8	80 44 28·4	1295·3
Baraoli	... 27 8 14·3	80 43 6·6	506·4	Mawa	... 26 15 59·0	80 33 47·7	494·0
Bukandpur	... 27 51 7·9	80 42 35·6	546·4	Meyhar	... 24 17 0·8	80 46 13·3	2039·3
Dagri	... 24 51 5·2	80 44 7·0	1644·5	Musapur	... 25 46 33·4	80 40 47·1	466·0
Dewarsan	... 26 15 51·1	80 20 44·4	492·7	Naunana	... 26 28 8·6	80 38 49·0	500·7
Dharkana	... 24 28 1·1	80 35 38·0	1917·7	Nimkar	... 27 21 5·1	80 31 30·6	527·7
Durawal	... 27 33 32·7	80 34 15·6	543·8	Parser	... 27 46 13·3	80 32 22·7	549·3
Etora	... 26 54 15·4	80 42 5·2	469·1	Patra	... 24 16 47·2	81 11 14·6	2306·5
Fatehnagar	... 27 23 55·5	80 42 50·8	510·3	Pavya	... 25 27 16·5	80 46 39 1	533·0
Jafrabad	... 26 0 42 5	80 38 3·6	476·4	Peprondi	... 25 37 39·2	80 26 45·2	494·9
Jajmao	... 26 25 49·6	80 27 9·7	515·8	Potenda	... 24 37 23·1	80 50 34·0	1050·2
Jalhotr	... 26 41 35·6	80 40 30·6	485 6	Rao	... 26 38 40·4	80 29 37·2	494·4
Jehanabad	... 26 6 4·8	80 24 18·3	488·1	Sarang	... 24 45 42·1	80 23 46·4	1748·9
Jerura	... 27 59 52·2	80 30 37·9	579·1	Seonda	... 25 18 9·1	80 24 5·5	908·6
Kanakera	... 25 51 19·6	80 27 58·6	473·7	Serwaya	... 27 37 40·1	80 40 50·1	542·2
Kartar	... 25 1 29·5	80 22 38·0	1179·8				

Extract from the Karara Meridional Series Report.

Amoli T. Station	... 27 5 38·1	81 23 38·0	514·2	Donci H. S.	... 24 53 56·6	81 13 45·1	1480·3
Asrafpur T. S.	... 27 29 23·7	81 4 8·5	550·0	Horesa T. S.	... 25 55 21·8	81 17 16·8	470·7
Bagala H. S.	... 25 14 8·6	81 39 12·7	687·7	Imlia T. S.	... 27 19 15·0	81 10 3·6	547·7
Basantpur T. S.	... 26 43 25·5	81 24 56·0	480·5	Jaliadhar H. S.	... 24 22 25·2	81 26 42·5	2237·5
Burwa H. S.	... 24 33 14·8	81 31 16·5	1360·8	Janai T S.	... 26 22 4 9	81 23 57·6	495·6
Dadar H. S.	... 24 36 14·0	81 14 45·9	1149 2	Kachar H. S.	... 24 56 43·6	81 5 18·0	1532·9

Extract from the Karara Meridional Series Report.—(Continued.)

Names of Places.	Lat.	Long.	Heights above Sea.	Names of Places.	Lat.	Long.	Heights above Sea.
	° ′ ″	° ′ ″	feet.		° ′ ″	° ′ ″	feet.
Karra T. S. ...	25 41 55·5	81 24 39·3	476·5	Porowa T. S. ...	26 38 1·8	81 14 37·5	494·2
Kelmur H. S.....	24 17 2·8	81 11 49·2	2320·2	Pesar T. S. ...	26 48 45·5	81 14 46·3	491·9
Khanpur T. S.....	27 38 57·3	81 11 49·9	543·1	Ragnopur T. S. ...	27 17 41·5	81 23 6·1	486·6
Khara T. S. ...	26 7 38·0	81 13 9·7	483·4	Salnon T. S. ...	26 1 42·5	81 29 43·5	494·4
Kotar Kelmari H.S.	24 43 19·9	81 2 51·7	1503·6	Samnadio T. S.....	27 10 4·6	81 14 1·1	525·8
Lalapur H. S. ...	25 14 13·4	81 8 23 2	843·7	Singrour T. S. ...	25 35 2·6	81 41 10·0	448·9
Majilgaon T. S.	25 45 13·8	81 13 17·1	470 6	Sirmoul H. S.....	24 53 6·8	81 26 7·3	1180·2
Masi T. S. ...	27 38 22·0	81 25 35·1	528·7	Sora T. S. ...	26 17 17·0	81 14 49·6	488·4
Mhow H. S. ...	25 0 43·8	81 18 11·7	1447·4	Tangan T. S. ...	26 2 51·2	81 19 9·4	485·5
Munai T. S. ...	26 10 49·5	81 23 6·3	474·0	Taoli T. S. ...	26 27 16·4	81 15 20·6	491·5
Nagdilpur T. S. ...	25 34 15·9	81 11 52·9	475·1	Thana T. S. ...	27 28 20·9	81 17 6·5	520·8
Naru H. S. ...	24 29 38·7	80 59 57·5	2034·5	Tikiri T. S. ...	26 32 40·5	81 25 0·8	492·6
Pabhosa H. S. ...	25 21 16·6	81 21 35·0	630·1	Turkani T. S. ...	26 54 46·4	81 25 20·1	507·1
Parinon T. S. ...	25 50 4·0	81 24 42·8	458·3	Utiamao T. S. ...	26 59 54·5	81 14 43·5	520·0

Extract from the South Parasnat Meridional Series Report.

Amjhori H. S. ...	21 51 26·7	86 21 47·7	3514·8	Kusumbani H. S....	21 57 28·9	86 28 25·0	3285 4
Badampahar H. S..	22 4 11·3	86 9 52·1	2706·2	Ledasal H. S. ...	22 41 15·3	86 31 0·8	1704·7
Bagmuri H. S. ...	22 29 1·7	86 9 26·2	2003·1	Meghasini H. S.....	21 37 56·6	86 23 29·6	3779·4
Bandari H. S. ...	22 50 32·9	86 34 7·3	1416·6	Murari H. S. ...	21 48 49·9	86 33 21 6	3106·7
Bari H. S. ...	23 6 52·4	86 35 45·1	729 2	Nilgiri H. S. ...	21 28 25·4	86 48 32·7	1733·3
Bolpal H. S. ...	21 22 2 4	86 30 27·5	1604·9	Parasa H. S. ...	23 7 17 2	86 43 7·1	915·4
Dalma H. S. ...	22 53 24·9	86 15 43·7	3049·7	Satbakra H. S. ...	22 19 2·8	86 28 12·7	1979·5
Gurgaburu H. S. ...	23 8 22·4	86 10 21·4	2220·4	Sideshar H. S. ...	22 36 38·0	86 25 57·0	1445·6
Kimira H. S. ...	21 39 35 7	86 41 10·4	530·0				

Extract from the Himalaya Longitudinal Series Report.

Banog H. S. ...	30 28 29·9	78 3 23·5	7548·7	Ghungti H. S. ...	29 45 29·9	78 57 47·9	7018·3
Bagwara S. ...	28 58 53·2	79 21 55·9	813·2	Girjwala H. S. ...	29 32 55·1	78 44 34·3	2820·8
Chandipahar H. S.	29 55 23·4	78 13 37·4	2013·4	Mabagarh H. S. ...	29 52 33 3	78 29 52·3	5748·4
Daila H. S. ...	29 26 26·0	79 1 53·9	2333·6	Ranigarh H. S. ...	30 3 58·0	78 45 21·9	7151·2
Dhoiwala H. S. ...	30 7 5·6	78 4 29·9	3064·3	Saonchalia H. S....	29 30 17·1	79 21 35·0	8591·9
Ghandial H. S. ...	30 13 18·6	78 27 54·9	7459·8				

Extract from the North Longitudinal or Connecting Series Report.

Asogapur S. ...	27 53 23·7	80 58 50·0	566·0	Khanpur S. ...	27 38 57·5	81 11 50·3	541·1
Bela S. ...	27 47 15·1	81 20 31·1	528·2	Kutia S. ...	28 2 38·0	80 58 8·0	581·7
Cholua S. ...	27 55 40·9	81 17 14·4	545·0	Lakan S. ...	27 48 50·7	81 9 9·8	554·7
Dalelnagar S. ...	28 4 12·7	80 41 9·1	618·3	Masi S. ...	27 38 22·1	81 25 35·3	530·7
Daorara S. ...	27 59 50·8	81 7 54·5	571·2	Ramnapur No. 2...	28 22 34·3	80 31 5·0	653·7
Hilji S. ...	28 8 24·4	80 50 11·0	610·4	Ramnagar S. ...	28 16 32·6	80 41 35·6	623·0
Karai S. ...	28 15 54·4	80 20 57·2	666·3	Sultanpur S. ...	28 25 3·9	80 21 11·3	690·6
Kakra S. ...	28 12 3 4	80 30 35·6	636·4	Sydara S. ...	27 58 4·0	80 49 13·3	612·0

Extract from the Calcutta Longitudinal Series Report.

Akistopur Tower S.	23 4 10·4	87 58 54·2	124·5	Calcutta Base line			
Aknapur T. S. ...	22 54 26 0	88 5 33·9	111·3	N. Tower... ...	22 43 35·0	88 25 3·9	85·6
Amna H. S. ...	23 59 57·0	80 31 44·2	2176·2	Calcutta Base line			
Balki T S. ...	23 28 1·2	87 39 23·3	242·2	S. Tower... ...	22 36 58·9	88 25 21·8	81·9
Baragni H. S. ...	23 32 58·6	85 29 38·2	3458·8	Chamki H. S. ...	23 34 10·9	81 40 43·0	2309·7
Beharistat H. S. ...	23 34 32·9	86 59 8·7	1469·1	Chapri H. S. ...	24 18 47·6	82 16 12·6	1898 4
Bola T. S. ...	22 49 31·2	88 13 58·0	101·0	Cheinpur H. S. ...	23 33 19·0	85 53 45·6	2096·7
Budhon H. S. ...	24 5 9·0	78 33 39·1	1910 4	Chondwar H. S.....	23 57 16·0	85 28 35·5	2827·8
Bulbul H. S. ...	23 37 46·5	84 28 40·5	3354·2	Dilakas T. S. ...	22 43 7·2	88 4 17·7	100·1
Calcutta Observatory. Park St...	22 33 0·8	88 23 58·8	78·4	Durgapur H. S. ...	23 49 43·9	86 49 2·0	1185·9
				Ganjua T. S. ...	22 58 29·8	87 36 2·3	193·0

GENERAL ALPHABETICAL LIST OF LATITUDES, LONGITUDES, AND HEIGHTS, OF VARIOUS PLACES UNDER THE BENGAL PRESIDENCY.

Extract from the Calcutta Longitudinal Series Report.—(Continued.)

Names of Places.	Lat.	Long.	Heights above Sea.	Names of Places.	Lat.	Long.	Heights above Sea.
	° ′ ″	° ′ ″	feet.		° ′ ″	° ′ ″	feet.
Gobra H. S.	... 23 37 6·5	83 31 26·0	3237·1	Narmao H. S.	... 23 30 18·6	78 52 16·4	2323·2
Gora H. S.	... 24 4 57·2	83 16 39·9	1867·6	Nibria T. S.	... 22 35 37·1	88 17 9·8	99·8
Gurwani H. S.	... 24 1 26·9	82 19 55·0	2120·9	Noda T. S.	... 22 40 10·6	88 25 6·6	95·8
Haori H. S.	... 24 12 20·8	82 46 15·6	1909·6	Parasnat H. S.	... 23 57 37·6	86 10 37·1	4483·0
Himilia H. S.	... 23 44 59·6	79 23 21·0	1539·9	Patal H. S.	... 23 40 27·8	85 9 53·4	2179·1
Hurilaong H. S.	... 24 2 7·9	84 24 16·9	1374·9	Pokra H. S.	... 24 18 49·0	82 31 5·0	2245·1
Kalumar H. S.	... 23 27 52·9	79 46 51·0	2544·4	Punchi H. S.	... 23 32 9·2	80 40 47·1	2341·7
Karara H. S.	... 24 4 43·0	81 18 14·1	2018·5	Radamadapur H. S.	23 31 58·3	87 21 3·8	368·9
Karasoli H. S.	... 23 14 18·1	87 27 37·3	325·2	Rampur H. S.	... 23 40 39·9	81 6 31·3	2435·6
Kasiatu H. S.	... 23 58 31·8	84 56 45·9	2662·5	Rangir H. S.	... 24 0 20·9	79 28 26·4	1235·7
Kusmar H. S.	... 24 14 45·4	79 22 51·0	1892·3	Sagar H. S.	... 23 49 48·6	78 48 45·4	2129·9
Lakanpura H. S.	... 24 2 50·7	80 49 51·3	1833·1	Salaia H. S.	... 23 49 51·7	79 58 30·8	1738·5
Lora H. S.	... 23 29 42·1	80 12 24·5	1993·3	Sateria H. S.	... 23 54 22·3	79 41 20 6	1641·8
Lul H. S.	... 23 44 54·0	82 32 58·3	3088·8	Sewari H. S.	... 23 58 25·8	83 47 39·3	1950·2
Madhpur T. S.	... 23 9 56·2	87 47 4·2	173·3	Susinia H. S.	... 23 23 45·8	87 1 39·8	1439·9
Maluncha H. S.	... 23 54 32·1	87 8 8·2	958·7	Teonda H. S.	... 23 48 33·4	78 14 0·0	1952·7
Mandra H. S.	... 23 38 42·1	79 8 53·3	1723·8	Tikeria H. S.	... 24 7 41·1	79 56 18·3	1763·8
Marchari H. S.	... 23 48 14·5	82 56 10·9	2336·3	Tilabani H. S.	... 23 25 2·5	86 35 41·2	1336·1
Mahrwas H. S.	... 24 5 0·4	81 49 2·0	1829·9	Tins H. S.	... 23 38 24·9	78 29 31·3	2345·4
Mubarakpur T. S.	... 22 50 31·3	87 49 58·3	123·2	Tinsmal H. S.	... 24 7 13·5	79 2 12·4	2218·9
Murergarh S.	... 23 35 35·8	82 0 15·1	3074·1	Turer H. S.	... 23 38 3·8	84 3 33·2	3107·4

Extract from the Budhon Meridional Series Report.

Akbarpur S.	... 29 4 51·5	78 40 51·3	787·6	Kilarmao S.	... 27 33 7·8	78 48 58·4	694·3
Algi H. S.	... 25 29 45·0	78 23 58·2	1235·5	Kundurki S.	... 28 43 32·2	78 27 2·8	760·9
Andhiari H. S.	... 24 41 6·5	78 16 16·2	1708·7	Lut S.	... 28 53 37·1	78 20 58·2	786·9
Athgath S.	... 26 47 56·8	78 45 4·4	663·3	Marbegarh S.	... 29 52 33·3	78 29 52·3	5715·8
Atora S.	... 28 42 37·0	78 39 43·6	763·2	Maharajpur H. S.	... 25 53 52·8	78 16 40·3	1097·3
Bansgopal S.	... 28 33 23·3	78 34 27·1	749·7	Mahesari S.	... 29 30 12·4	78 11 19·2	885·3
Baragaon S.	... 27 14 59 7	78 44 42·6	708·4	Majhar H. S.	... 26 6 15·1	78 30 44·9	1112·0
Baraoli S.	... 28 31 57·6	78 47 56·4	723·2	Mehtra S.	... 28 22 1·4	78 41 24·1	726 6
Bhataoli S.	... 28 53 55·4	78 46 1·0	757·9	Milik S.	... 29 4 37·3	78 27 55·9	812·1
Bhind S.	... 26 33 30·5	78 50 14·4	647·9	Nandi S.	... 29 17 1·9	78 48 59·8	839·9
Bhitari H. S.	... 25 28 3·4	78 46 39·5	1135·6	Narwar H. S.	... 25 37 21·0	77 57 56·4	1571·9
Chandanpur S.	... 28 33 54·2	78 20 59·5	721·0	Paraoli S.	... 28 9 41·0	78 23 31·6	720·1
Chandi H. S.	... 29 55 23·4	78 13 37·4	1981·7	Patna H. S.	... 24 20 3·9	78 39 36·2	1899·7
Dargawa H. S.	... 24 37 13·1	79 3 51·8	1531·1	Pinaht S.	... 26 52 36·3	78 24 58·9	675·0
Dariapur H. S.	... 25 42 11·0	78 40 55·9	875·1	Pandri S.	... 27 27 49·0	78 26 52·3	731·0
Ferozabad S.	... 27 8 34·3	78 25 56·3	690·2	Raipur H S.	... 26 8 12·4	78 7 16·1	1302·7
Godna S.	... 29 37 12 5	77 56 30·4	966·3	Rajaoli S.	... 28 22 23·0	78 27 40·2	701·4
Gurmi S.	... 26 36 1·1	78 33 17·1	660·6	Sakrora S.	... 28 13 8·2	78 35 43·4	691·9
Gwali H. S.	... 25 10 25·0	78 28 5·2	1289·2	Salempur S.	... 27 46 32·6	78 33 16·6	732·4
Haldour S.	... 29 16 35·6	78 18 33·6	873·9	Sanichri H. S.	... 26 23 29·0	78 15 30·0	909·8
Harpalised H. S.	... 29 39 44·9	78 35 48·3	2944·0	Sankrao S.	... 28 2 24·8	78 34 30·3	752 9
Dhandkura H. S.	... 24 47 35·0	78 45 44·0	1369·4	Sarkara S.	... 29 15 41·3	78 34 47·7	830·5
Jamalpur S.	... 27 48 6·9	78 51 35·3	684·5	Sarsotha S.	... 28 5 55·6	78 47 40·6	687·5
Jhankri H. S.	... 26 18 51·8	78 34 41·4	709·5	Sheopuri S.	... 29 18 53·5	78 1 58·8	935·1
Karaia H. S.	... 25 53 45·4	78 2 43·7	1370·2	Sherpur S.	... 27 0 38·4	78 41 33·2	665·4
Kariami S.	... 28 15 3·0	78 48 2·2	701·7	Sirsa S.	... 28 54 34·5	78 34 33·6	810·4
Kathera H. S.	... 25 14 20·0	78 59 39·1	1429·3				

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